TNPSC 2026

COMBINED CIVIL SERVICES (PRELIMINARY)

GROUP-1

General Studies

Part-I

NODIA

GENERAL SCIENCE

CHAPTERWISE MCQ BANK

- 2000+ MCQs with Full Explanation
- As per Syllabus released by TNPSC

Scan QR for Demo PDF

Nodia

GET ALL STUDY MATERIAL IN ONE APP!

- Textbooks
- Previous Year Chapterwise Question Banks
- 30 Sets Sample Papers
- Worksheets

FREE!

DOWNLOAD NOW!

SCAN & DOWNLOAD

GET IT ON Google Play

TNPSC 2026

Combined Civil Services (Preliminary)

GROUP-I

General Studies Part-I

GENERAL SCIENCE

CHAPTER-WISE MCQ BANK
As Per Syllabus Released By TNPSC

NODIA

Downloaded from www.pdf.tube

TNPSC Part-I General Science
Edition June 2026
Published by : NODIA
An Imprint of NODIA EDITIONS LLP

Information contained in this book has been obtained by author, from sources believes to be reliable. However, neither NODIA nor its author guarantee the accuracy or completeness of any information herein and NODIA nor its author shall be responsible for any error, omissions, or damages arising out of use of this information. This book is published with the understanding that NODIA and its author are supplying information but are not attempting to render engineering or other professional services.

© NODIA EDITIONS LLP

MRP ₹510.00

NODIA

NODIA EDITIONS LLP
125, Sector 6, Vidyadhar Nagar, Jaipur 302039
Phone :+91 9001005245
email : mail@nodia.in

CONTENTS

CHAP 01	Nature of Science and Scientific Reasoning	9
CHAP 02	Science as a Tool Understanding the Universe	50
CHAP 03	Mechanics and Properties of Matter	92
CHAP 04	Electricity, Magnetism, Light and Sound	131
CHAP 05	Heat, Nuclear Physics, Laser, Electronics and Communications	171
CHAP 06	Elements, Compounds, Acids, Bases and Salts	213
CHAP 07	Applied Chemistry: Petroleum, Fertilizers and Pesticides	252
CHAP 08	Life Science: Classification, Evolution and Genetics	293
CHAP 09	Physiology, Nutrition, Health and Hygiene	333
CHAP 10	Human Diseases: Communicable and Non-Communicable	374
CHAP 11	Space Science and Defence Technology	414
CHAP 12	Environment, Ecology, Current Science and Technology	456

****

Click Here to Buy book on Amazon

TNPSC

TNPSC
PREVIOUS YEAR
EXAMINATION PAPERS

Previous Year Question Papers are a key to success in TNPSC Examinations. Practice well, analyze smartly, and achieve your goal.

WHY SOLVE PREVIOUS YEAR PAPERS?

- Understand Exam Pattern
- Identify Important Topics
- Improve Speed & Accuracy
- Boost Confidence & Performance

TO DOWNLOAD PAPERS

Go to **pdf.tube** to download TNPSC Previous Year Papers.

NODIA

STEPS TO DOWNLOAD

1. Go to pdf.tube
2. Search "TNPSC Previous Year Papers"
3. Select the required paper
4. Download and start practicing!

SUCCESS TIP

Regular practice of Previous Year Papers helps you analyze your preparation and score better in the exam.

Practice Today, Succeed Tomorrow!

PRACTICE Practice more | **ANALYZE** Analyze smartly | **SUCCEED** Achieve your goal

★ YOUR HARD WORK TODAY, YOUR SUCCESS TOMORROW! ★

Combined Civil Services (Preliminary) Examination – I (Group I Services)

[Single Paper consisting of General Studies (Degree Standard – 175 questions), and Aptitude and Mental Ability (SSLC Standard – 25 questions)]

Code:497

Part A: General Studies (Degree Standard – 175 Questions)

Unit I: General Science (10 Questions)

Scientific knowledge and scientific temper - Power of reasoning - Rote learning vs conceptual learning - Science as a tool to understand the past, present, and future; Nature of universe - General scientific laws – Mechanics - Properties of matter, force, motion, and energy - Everyday application of the basic principles of mechanics, electricity and magnetism, light, sound, heat, nuclear physics, laser, electronics, and communications; Elements and compounds, acids, bases, salts, petroleum products, fertilizers, pesticides; Main concepts of life science, classification of living organisms, evolution, genetics, physiology, nutrition, health and hygiene, human diseases; Environment and ecology; Latest inventions in science and technology; Current affairs.

Unit II: Geography of India (10 Questions)

Location - Physical features - Monsoon, rainfall, weather and climate - Water resources - Rivers in India - Soil, Minerals and Natural Resources - Forest and Wildlife - Agricultural pattern; Transport – Communication; Social Geography – Population density and distribution - Racial, linguistic groups and major tribes; Natural calamity - Disaster management – Environmental pollution - Reasons and preventive measures - Climate change - Green energy; Geographical landmarks; Current affairs.

Unit III: History, Culture of India, and Indian National Movement (25 Questions)

Indus Valley Civilization - Guptas, Delhi Sultans, Mughals, and Marathas - Age of Vijayanagaram and Bahmani Kingdoms - South Indian History; Change and continuity in the socio-cultural history of India; National Renaissance - Early uprising against British rule - Indian National Congress - Emergence of leaders – B.R.Ambedkar, Bhagat Singh, Bharathiar, V.O.Chidambaranar, Jawaharlal Nehru, Kamarajar, Mahatma Gandhi, Maulana Abul Kalam Azad, Thanthai Periyar, Rajaji, Subash Chandra Bose, Rabindranath Tagore, and others; Different modes of agitation: Growth of Satyagraha and Militant Movements; Communalism and Partition; Characteristics of Indian Culture, Unity in Diversity – Race, Language, Custom; India as a Secular State, Social Harmony; Prominent personalities in various spheres – Arts, Science, Literature and Philosophy; National symbols – Eminent personalities and places in news – Sports – Books and Authors; Current affairs.

Unit IV: Indian Polity (40 Questions)

Constitution of India - Preamble to the Constitution - Salient features of the Constitution - Union, State and Union Territory - Citizenship, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy - Union Executive, Union Legislature - State Executive, State Legislature - Local Governments, Panchayat Raj - Spirit of federalism: Centre - State relationships - Election - Judiciary in India – Rule of Law - Corruption in public life – Anti-corruption measures - Lokpal and Lok Ayukta - Right to Information - Empowerment of Women - Consumer Protection Forums, Human Rights Charter; Political parties and political system in India; Current affairs.

Unit V: Indian Economy and Development Administration in Tamil Nadu (50 Questions)

Nature of Indian Economy – Five-year plan models - an assessment - Planning Commission and Niti Aayog; Sources of revenue - Reserve Bank of India - Fiscal Policy and Monetary Policy - Finance Commission - Resource sharing between Union and State Governments - Goods and Services Tax; Structure of Indian economy and employment generation, Land Reforms and Agriculture - Application of Science and Technology in Agriculture - Industrial growth - Rural welfare oriented programmes - Social problems - Population, Education, Health, Employment, Poverty; Human Development Indicators in Tamil Nadu and a comparative assessment across the

Downloaded from www.pdf.tube

Country – Impact of social reform movements in the socio-economic development of Tamil Nadu - Political parties and welfare schemes for various sections of people - Rationale behind the reservation policy, and access to the social resources - Economic trends in Tamil Nadu - Role and impact of social welfare schemes in the socio-economic development of Tamil Nadu - Social justice and social harmony as the cornerstones of socio-economic development; Education and health systems in Tamil Nadu; Geography of Tamil Nadu and its impact on economic growth; Achievements of Tamil Nadu in various fields; e-Governance in Tamil Nadu; Public awareness and General administration - Welfare oriented Government schemes and their utility, Problems in public delivery systems; Current socio-economic issues; Current affairs.

Unit VI: History, Culture, Heritage, and Socio-Political Movements in Tamil Nadu (40 Questions)

History of Tamil Society, related archaeological discoveries, Tamil literature from Sangam age till contemporary times; Thirukkural - Significance as a secular literature - Relevance to everyday life, Impact of Thirukkural on humanity, Thirukkural and universal values - Relevance to Socio-politico-economic affairs, Philosophical content in Thirukkural; Role of Tamil Nadu in freedom struggle - Early agitations against British Rule - Role of women in freedom struggle; Evolution of 19th and 20th century socio-political movements in Tamil Nadu - Justice Party, Growth of Rationalism - Self Respect Movement, Dravidian Movement, and principles underlying both these movements; Contributions of Thanthai Periyar and Perarignar Anna.

NOTA

Part B: Aptitude and Mental Ability (SSLC Standard - 25 Questions)

Unit I: Aptitude (15 Questions)

Simplification - Percentage - Highest Common Factor (HCF) - Lowest Common Multiple (LCM) - Ratio and Proportion - Simple interest - Compound interest - Area - Volume - Time and Work.

Unit II: Reasoning (10 Questions)

Logical reasoning - Puzzles - Dice - Visual reasoning - Alpha numeric reasoning - Number series.

Date: 16.12.2024

ஒருங்கிணைந்த குடிமைப் பணிகள் (முதல்நிலை) தேர்வு-I (தொகுதி I பணிகள்)

[பொது அறிவு (பட்டப்படிப்புத் தரம் - 175 கேள்விகள்) மற்றும் திறனறிவும் மனக்கணக்கு நுண்ணறிவும் (பத்தாம் வகுப்புத் தரம் - 25 கேள்விகள்) அடங்கிய ஒரு தாள்]

குறியீடு: 497

பகுதி அ: பொது அறிவு (பட்டப்படிப்புத் தரம்) (175 கேள்விகள்)

அலகு I: பொது அறிவியல் (10 கேள்விகள்)
அறிவியல் அறிவு மற்றும் அறிவியல் உணர்வு - பகுத்தறிதல் - பொருள் உணராமல் கற்றலும் கருத்துணர்ந்து கற்றலும் - கடந்தகாலம், நிகழ்காலம், எதிர்காலம் பற்றி புரிந்து கொள்வதற்கான ஒரு கருவி அறிவியல்; பேரண்டத்தின் இயல்பு - பொது அறிவியல் விதிகள் - இயக்கவியல் - பருப்பொருளின் பண்புகள், விசை, இயக்கம் மற்றும் ஆற்றல் - அன்றாட வாழ்வில் இயக்கவியல், மின்னியல், காந்தவியல், ஒளி, ஒலி, வெப்பம், அணுக்கரு இயற்பியல், லேசர் (LASER), மின்னணுவியல் மற்றும் தகவல் தொடர்பியல் ஆகியவற்றின் அடிப்படை கோட்பாடுகளின் பயன்பாடுகள்; தனிமங்களும் சேர்மங்களும், அமிலங்கள், காரங்கள், உப்புகள், பெட்ரோலிய பொருட்கள், உரங்கள், பூச்சிகொல்லிகள்; உயிரியலின் முக்கிய கோட்பாடுகள், உயிர் உலகின் வகைப்பாடு, பரிணாமம், மரபியல், உடலியங்கியல், உணவியல், உடல்நலம் மற்றும் சுகாதாரம், மனிதநோய்கள்; சுற்றுப்புறச்சூழல் மற்றும் சூழலியல்; அறிவியல் மற்றும் தொழில்நுட்பத்தில் அண்மைக்கால கண்டுபிடிப்புகள்; நடப்பு நிகழ்வுகள்.

அலகு II: இந்தியாவின் புவியியல் (10 கேள்விகள்)
அமைவிடம் - இயற்கை அமைவுகள் - பருவமழை, மழைப்பொழிவு, வானிலை மற்றும் காலநிலை - நீர் வளங்கள் - இந்திய ஆறுகள் - மண், கனிம வளங்கள் மற்றும் இயற்கை வளங்கள் - காடு மற்றும் வன உயிரினங்கள் - வேளாண் முறைகள்; போக்குவரத்து - தகவல் தொடர்பு; சமூகப் புவியியல் - மக்கள்தொகை அடர்த்தி மற்றும் பரவல் - இனம், மொழிக் குழுக்கள் மற்றும் முக்கியப் பழங்குடிகள்; இயற்கைப் பேரிடர் - பேரிடர் மேலாண்மை; சுற்றுச்சூழல் மாசுபடுதல் - காரணங்களும் தடுப்பு முறைகளும் - பருவநிலை மாற்றம் - பசுமை ஆற்றல்; புவியியல் அடையாளங்கள்; நடப்பு நிகழ்வுகள்.

அலகு III: இந்தியாவின் வரலாறு, பண்பாடு மற்றும் இந்திய தேசிய இயக்கம் (25 கேள்விகள்)
சிந்து சமவெளி நாகரிகம் - குப்தர்கள், தில்லி சுல்தான்கள், முகலாயர்கள் மற்றும் மராத்தியர்கள் - விஜயநகர மற்றும் பாமினி அரசுகளின் காலம் - தென் இந்திய வரலாறு; இந்திய சமூகப் பண்பாட்டு வரலாற்றில் மாற்றங்களும் தொடர்ச்சியும்; தேசிய மறுமலர்ச்சி - ஆங்கிலேயர் ஆட்சிக்கு எதிரான தொடக்க கால எழுச்சிகள் - இந்திய தேசிய காங்கிரஸ் - தலைவர்கள் உருவாதல் - பி.ஆர்.அம்பேத்கர், பகத்சிங், பாரதியார், வ.உ.சிதம்பரனார், ஜவகர்லால் நேரு, காமராசர், மகாத்மா காந்தி, மௌலானா அபுல் கலாம் ஆசாத், தந்தை பெரியார், இராஜாஜி, சுபாஷ் சந்திர போஸ், ரவீந்திரநாத் தாகூர் மற்றும் பலர்; விடுதலைப் போராட்டத்தின் பல்வேறு நிலைகள்: அகிம்சை முறையின் வளர்ச்சி மற்றும் புரட்சிகர இயக்கங்கள்; வகுப்புவாதம் மற்றும் தேசப்பிரிவினை; இந்தியப் பண்பாட்டின் இயல்புகள், வேற்றுமையில் ஒற்றுமை - இனம், மொழி, வழக்காறு; இந்தியா ஒரு மதச்சார்பற்ற நாடு, சமூக நல்லிணக்கம்; கலை, அறிவியல், இலக்கியம் மற்றும் தத்துவம் ஆகிய வெவ்வேறு துறைகளில் தனித்துவம் கொண்ட ஆளுமைகள்; தேசிய சின்னங்கள் - செய்திகளில் இடம்பெற்ற சிறந்த ஆளுமைகளும் இடங்களும் - விளையாட்டு - நூல்களும் ஆசிரியர்களும்; நடப்பு நிகழ்வுகள்.

அலகு IV: இந்திய ஆட்சியியல் (40 கேள்விகள்)
இந்திய அரசியலமைப்பு - அரசியலமைப்பின் முகவுரை - அரசியலமைப்பின் முக்கிய கூறுகள் - ஒன்றியம், மாநிலம் மற்றும் யூனியன் பிரதேசங்கள்; குடியுரிமை, அடிப்படை உரிமைகள், அடிப்படைக் கடமைகள், அரசின் நெறிமுறைக் கோட்பாடுகள்; ஒன்றிய நிர்வாகம், ஒன்றிய நாடாளுமன்றம் - மாநில நிர்வாகம், மாநில சட்டமன்றம் - உள்ளாட்சி அமைப்புகள், பஞ்சாயத்து ராஜ்; கூட்டாட்சியின் அடிப்படைத் தன்மைகள்; மத்திய - மாநில உறவுகள்; தேர்தல் - இந்திய நீதி அமைப்புகள் - சட்டத்தின் ஆட்சி; பொதுவாழ்வில் ஊழல் - ஊழல் தடுப்பு நடவடிக்கைகள்- லோக்பால் மற்றும் லோக் ஆயுக்தா - தகவல் உரிமை - பெண்களுக்கு அதிகாரமளித்தல் - நுகர்வோர் பாதுகாப்பு அமைப்புகள் - மனித உரிமைகள் சாசனம்; இந்தியாவில் அரசியல் கட்சிகளும் மற்றும் ஆட்சியல் முறைகளும்; நடப்பு நிகழ்வுகள்.

அலகு V: இந்தியப் பொருளாதாரம் மற்றும் தமிழ்நாட்டில் வளர்ச்சி நிர்வாகம் (50 கேள்விகள்)
இந்தியப் பொருளாதாரத்தின் இயல்புகள் - ஐந்தாண்டு திட்ட மாதிரிகள் - ஒரு மதிப்பீடு - திட்டக்குழு மற்றும் நிதி ஆயோக்; வருவாய் ஆதாரங்கள் - இந்திய ரிசர்வ் வங்கி - நிதி கொள்கை மற்றும் பணவியல் கொள்கை - நிதி ஆணையம் - மத்திய மாநில அரசுகளுக்கிடையேயான நிதிப் பகிர்வு -

Click Here to Buy book on Amazon

சரக்கு மற்றும் சேவை வரி; இந்திய பொருளாதார அமைப்பு மற்றும் வேலைவாய்ப்பு உருவாக்கம், நிலச் சீர்திருத்தங்கள் மற்றும் வேளாண்மை - வேளாண்மையில் அறிவியல் தொழில்நுட்பத்தின் பயன்பாடு - தொழில் வளர்ச்சி - ஊரக நலன்சார் திட்டங்கள் - சமூகப் பிரச்சனைகள் - மக்கள் தொகை, கல்வி, நலவாழ்வு, வேலைவாய்ப்பு, வறுமை; தமிழ்நாட்டின் மனிதவள மேம்பாட்டுக் குறியீடுகளும் அவற்றை தேசிய மற்றும் பிற மாநிலங்களுக்கான குறியீடுகளுடன் ஒப்பாய்வும் - தமிழ்நாட்டின் சமூக பொருளாதார வளர்ச்சிக்கு சமூக மறுமலர்ச்சி இயக்கங்களின் பங்களிப்பு; அரசியல் கட்சிகளும் பலதரப்பு மக்களுக்கான நலத்திட்டங்களும் - இடஒதுக்கீட்டுக் கொள்கைக்கான நியாயங்களும் சமூக வளங்களைப் பெறும் வாய்ப்புகளும் - தமிழ்நாட்டின் பொருளாதார போக்குகள் - தமிழ்நாட்டின் சமூக பொருளாதார வளர்ச்சியில் சமூகநலத் திட்டங்களின் தாக்கமும் பங்களிப்பும்; சமூக நீதியும் சமூக நல்லிணக்கமும் சமூகப் பொருளாதார மேம்பாட்டின் மூலாதாரங்கள்; தமிழ்நாட்டின் கல்வி மற்றும் நலவாழ்வு (Health) முறைமைகள்; தமிழ்நாட்டின் புவியியல் கூறுகளும் பொருளாதார வளர்ச்சியில் அவற்றின் தாக்கமும்; பல்வேறு துறைகளில் தமிழ்நாடு நிகழ்த்தியுள்ள சாதனைகள்; தமிழ்நாட்டில் மின்னாளுகை; பொது விழிப்புணர்வும் (Public Awareness) பொது நிர்வாகமும் - நலன்சார் அரசுத் திட்டங்களும் அவற்றின் பயன்பாடும், பொது விநியோக அமைப்புகளில் (Public delivery systems) நிலவும் சிக்கல்கள்; தற்போதைய சமூகப் பொருளாதார பிரச்சனைகள்; நடப்பு நிகழ்வுகள்.

அலகு VI: தமிழ்நாட்டின் வரலாறு, பண்பாடு, மரபு மற்றும் சமூக - அரசியல் இயக்கங்கள் (40 கேள்விகள்)

தமிழ் சமுதாய வரலாறு, அது தொடர்பான தொல்லியல் கண்டுபிடிப்புகள், சங்க காலம் முதல் இக்காலம் வரையிலான தமிழ் இலக்கிய வரலாறு; திருக்குறள் - மதச் சார்பற்ற தனித்தன்மையுள்ள இலக்கியம் - அன்றாட வாழ்வியலோடு தொடர்புத் தன்மை - மானுடத்தின் மீதான திருக்குறளின் தாக்கம் - திருக்குறளும் மாறாத விழுமியங்களும் - சமூக அரசியல் பொருளாதார நிகழ்வுகளில் திருக்குறளின் பொருத்தப்பாடு - திருக்குறளில் தத்துவக் கோட்பாடுகள்; விடுதலைப் போராட்டத்தில் தமிழ்நாட்டின் பங்கு - ஆங்கிலேயருக்கு எதிரான தொடக்க கால கிளர்ச்சிகள் - விடுதலைப் போராட்டத்தில் பெண்களின் பங்கு; பத்தொன்பது மற்றும் இருபதாம் நூற்றாண்டுகளில் தமிழ்நாட்டின் சமூக - அரசியல் இயக்கங்களின் பரிணாம வளர்ச்சி - நீதிக்கட்சி, பகுத்தறிவு வாதத்தின் வளர்ச்சி - சுயமரியாதை இயக்கம், திராவிட இயக்கம் மற்றும் இவ்வியக்கங்களுக்கான அடிப்படை கொள்கைகள், தந்தை பெரியார் மற்றும் பேரறிஞர் அண்ணாவின் பங்களிப்புகள்.

பகுதி ஆ: திறனறிவும் மனக்கணக்கு நுண்ணறிவும்
(பத்தாம் வகுப்புத் தரம் - 25 கேள்விகள்)

அலகு I: திறனறிவு (15 கேள்விகள்)

சுருக்குதல் - விழுக்காடு - மீப்பெரு பொதுக் காரணி (HCF) - மீச்சிறு பொது மடங்கு (LCM); விகிதம் மற்றும் விகிதாச்சாரம்; தனிவட்டி - கூட்டு வட்டி - பரப்பு - கொள்ளளவு - காலம் மற்றும் வேலை.

அலகு II: காரணவியல் (10 கேள்விகள்)

தருக்கக் காரணவியல் - புதிர்கள் - பகடை - காட்சிக் காரணவியல் - எண் எழுத்துக் காரணவியல் - எண் வரிசை.

Date: 16.12.2024

Downloaded from www.pdf.tube

CHAPTER 01
Nature of Science and Scientific Reasoning

1. Consider the following statements regarding deductive reasoning in science:
I. It involves moving from general principles to specific conclusions.
II. It is primarily used to formulate completely new scientific theories.
III. It guarantees a true conclusion if the premises are true and the logic is valid.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

2. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Article 51A(h) of the Indian Constitution makes it a fundamental duty to develop the scientific temper, humanism, and the spirit of inquiry.
Reason (R): Scientific temper ensures the complete eradication of all religious practices in India.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

3. Match the following scientific institutions in India with their primary domain of research:
List I: (Institution)
P. CSIR
Q. ISRO
R. DRDO
S. DBT
List II: (Research Domain)
I. Space exploration and satellite technology
II. Defence and military technology
III. Biotechnology and life sciences
IV. Industrial and applied scientific research
(A) P-IV, Q-I, R-II, S-III
(B) P-I, Q-IV, R-III, S-II
(C) P-IV, Q-II, R-I, S-III
(D) P-III, Q-I, R-II, S-IV
(E) Answer not known

4. Which of the following pairs is correctly matched regarding modern Indian scientists and their contributions?
(A) Srinivasa Ramanujan - Development of theoretical quantum statistics
(B) C.V. Raman - Engineering of modern space launch vehicles
(C) J.C. Bose - Plant neurobiology and wireless communication
(D) A.P.J. Abdul Kalam - Fundamental discovery of the Raman Effect
(E) Answer not known

5. Which of the following best defines the term 'Pseudoscience'?
(A) A collection of beliefs or practices mistakenly regarded as being based on scientific method.
(B) A branch of science that deals strictly with theoretical physics and mathematical modeling.
(C) A preliminary stage of hypothesis testing before a scientific law is established.
(D) The study of ancient scientific methods used by early civilizations.
(E) Answer not known

6. The National Science Day in India is celebrated on February 28 to commemorate which of the following events?
(A) The birth anniversary of Sir C.V. Raman
(B) The successful launch of Aryabhata satellite
(C) The establishment of the Department of Science and Technology
(D) The discovery of the Raman Effect
(E) Answer not known

NODIA

7. Which of the following represents the correct sequence of the steps involved in the scientific method?
(A) Observation, Hypothesis, Experiment, Conclusion
(B) Hypothesis, Conclusion, Experiment, Observation
(C) Experiment, Observation, Conclusion, Hypothesis
(D) Conclusion, Hypothesis, Observation, Experiment
(E) Answer not known

8. Consider the following statements regarding the limitations of rote learning in science education:
I. It discourages critical thinking and problem-solving skills.
II. It promotes a deep conceptual understanding of scientific phenomena.
III. It relies heavily on memorization without grasping the underlying logic.
IV. It hinders the student's ability to apply knowledge to new situations.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II and IV
(D) I and III
(E) Answer not known

9. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): A scientific theory is a well-substantiated explanation of some aspect of the natural world.
Reason (R): A scientific theory becomes a scientific law once it is proven by more than one independent researcher.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

10. Match the following concepts of learning with their corresponding descriptions:
List I: (Concept)
P. Rote Learning
Q. Conceptual Learning
R. Critical Thinking
S. Scientific Temper
List II: (Description)
I. Analyzing and evaluating information objectively
II. Memorizing facts without understanding
III. Questioning assumptions and seeking rational explanations
IV. Connecting new ideas to existing knowledge frameworks
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-III, S-I
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

11. Which of the following pairs is incorrectly matched regarding elements of scientific inquiry?
(A) Observation - Gathering data through senses or instruments
(B) Hypothesis - A proven fact that cannot be challenged
(C) Experiment - A controlled procedure to test a hypothesis
(D) Conclusion - A judgment based on the analysis of experimental data
(E) Answer not known

12. In which year was the first Scientific Policy Resolution (SPR) adopted by the Government of India to promote science and scientific temper?
(A) 1947
(B) 1958
(C) 1983
(D) 2003
(E) Answer not known

13. Identify the correct statement regarding scientific knowledge.
(A) Knowledge based on empirical data and subject to revision.
(B) Knowledge that is absolute and can never be modified under any historical circumstances.
(C) Knowledge that relies entirely on individual opinions rather than observable phenomena.
(D) Knowledge that is valid only if it aligns with traditional or regional cultural beliefs.
(E) Answer not known

Click Here to Buy book on Amazon

14. Arrange the following stages of fostering an innovation in the correct logical sequence:
I. Commercialization
II. Idea Generation
III. Prototype Testing
IV. Research and Development
(A) II, IV, III, I
(B) I, II, III, IV
(C) II, III, IV, I
(D) IV, II, I, III
(E) Answer not known

15. Consider the following statements regarding the contributions of Dr. A.P.J. Abdul Kalam:
I. He played a pivotal role in India's civilian space programme.
II. He was instrumental in the development of military missile technology.
III. He served as the Chief Project Builder for the SLV-III.
IV. He won the Nobel Prize in Physics for his work on aerospace engineering.
V. He actively promoted science education and inspired students across the nation.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, II, III and V
(C) II, III and V
(D) I, IV and V
(E) Answer not known

16. Identify the incorrect statement regarding Nobel Prize winners of Indian origin in Science.
(A) Har Gobind Khorana shared the Nobel Prize for his work on the interpretation of the genetic code.
(B) Venkatraman Ramakrishnan won the Nobel Prize in Chemistry for studies on the structure and function of the ribosome.
(C) Subrahmanyan Chandrasekhar was awarded the Nobel Prize for his discoveries concerning plant neurobiology.
(D) C.V. Raman was awarded the Nobel Prize in Physics for his work on the scattering of light.
(E) Answer not known

17. Which of the following is NOT an objective of promoting citizen science?
(A) To engage the general public in collecting and analyzing scientific data.
(B) To restrict scientific research exclusively to PhD-holding professionals.
(C) To enhance public understanding and awareness of scientific processes.
(D) To build large datasets for environmental monitoring and biodiversity tracking.
(E) Answer not known

18. Which of the following represents the most appropriate distinction between Science and Technology?
(A) Science focuses on inventing specialized industrial tools, while Technology focuses on discovering natural laws.
(B) Science is always purely theoretical, while Technology requires no established theoretical or logical foundation.
(C) Science is a modern concept, while Technology has only existed since the era of the Industrial Revolution.
(D) Science understands the natural world; technology applies that knowledge.
(E) Answer not known

19. A student notices that bread dough rises when yeast is added. Using this observation to learn about fermentation is an example of:
(A) Concept application of science in everyday life
(B) Rote learning of biological definitions
(C) Superstitious belief in spontaneous generation
(D) Deductive reasoning from abstract mathematics
(E) Answer not known

20. The logical process where specific examples are synthesized to form a generalized rule or principle is classified as:
(A) Deductive reasoning
(B) Abductive reasoning
(C) Inductive reasoning
(D) Fallacious reasoning
(E) Answer not known

21. Consider the following statements regarding the Patent system in India:
I. It grants the inventor an exclusive right to manufacture and sell their invention for a limited period.
II. Scientific theories and mathematical

NODIA

methods are readily patentable under the Indian Patent Act.
III. It aims to encourage innovation by protecting the intellectual property of scientists and inventors.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

22. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): The Atal Innovation Mission (AIM) was established to promote a culture of innovation and entrepreneurship in India.
Reason (R): AIM focuses on establishing tinkering labs in schools to foster scientific curiosity among children.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

23. Match the following ancient Indian scholars with their notable fields of contribution:
List I: (Scholar)
P. Aryabhata
Q. Sushruta
R. Charaka
S. Kanad
List II: (Contribution)
I. Atomic theory (Vaisheshika sutra)
II. Mathematics and Astronomy
III. Ancient Indian Medicine (Ayurveda)
IV. Ancient Surgical procedures
(A) P-II, Q-IV, R-III, S-I
(B) P-I, Q-III, R-IV, S-II
(C) P-II, Q-III, R-IV, S-I
(D) P-IV, Q-II, R-I, S-III
(E) Answer not known

24. Which of the following pairs is incorrectly matched regarding Tamil Nadu based scientific establishments?
(A) CSIR-CLRI Leather Research Institute - Chennai
(B) CSIR-CECRI Electrochemical Research Institute - Karaikudi
(C) VSSC - Coimbatore
(D) IGCAR Nuclear Research Centre - Kalpakkam
(E) Answer not known

25. When comparing Invention and Innovation, which of the following statements is true?
(A) Innovation is the creation of a completely new idea, while invention is merely copying existing technologies.
(B) Invention is the formulation of a new idea; innovation is its practical implementation.
(C) Invention always leads to commercial success, whereas innovation is strictly confined to research laboratories.
(D) Invention and innovation are perfectly synonymous terms used interchangeably in regional science policy.
(E) Answer not known

26. Which of the following is a defining feature of conceptual learning?
(A) Ability to transfer knowledge and apply it to novel situations.
(B) Memorization of textbook definitions without logical linkage.
(C) Complete reliance on authority without asking questions.
(D) Studying purely to reproduce facts during an examination.
(E) Answer not known

27. Which of the following is the correct sequence of the evolution of Science Policies in India?
(A) Scientific Policy Resolution, Technology Policy Statement, Science and Technology Policy, Science Technology and Innovation Policy
(B) Technology Policy Statement, Scientific Policy Resolution, Science Technology and Innovation Policy, Science and Technology Policy
(C) Science and Technology Policy, Scientific Policy Resolution, Technology Policy Statement, Science Technology and Innovation Policy
(D) Science Technology and Innovation Policy, Technology Policy Statement, Scientific Policy Resolution, Science and Technology

Downloaded from www.pdf.tube

Policy
(E) Answer not known

28. Consider the following statements regarding ethics in scientific research:
I. Plagiarism involves using someone else's work or ideas without proper acknowledgement.
II. Falsification of data is an acceptable practice if it supports a highly probable hypothesis.
III. Ethical guidelines protect human and animal subjects during experimental trials.
IV. Responsible conduct of research strengthens public trust in scientific findings.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II and IV
(D) I and IV
(E) Answer not known

29. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Observation is considered a passive foundation of scientific inquiry, whereas experimentation is an active intervention.
Reason (R): In an experiment, the researcher controls and manipulates variables to observe the effects.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

30. Match the everyday scientific phenomena with the principles behind them:
List I: (Phenomenon)
P. Cooling effect of an earthen pot
Q. Working of a pressure cooker
R. Formation of a rainbow
S. Rising of dough using yeast
List II: (Principle)
I. Increased boiling point due to high pressure
II. Evaporation leading to cooling
III. Anaerobic respiration and release of CO2
IV. Dispersion and total internal reflection of light
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-I, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

31. Which of the following pairs is correctly matched regarding women scientists in India?
(A) Asima Chatterjee - Aerospace and aeronautical engineering
(B) Anna Mani - Fundamental studies in quantum mechanics
(C) Tessy Thomas - Research in plant pathology
(D) Janaki Ammal - Botany
(E) Answer not known

32. Which of the following is a classic example of pseudoscience?
(A) Studying the geological strata to determine the age of the Earth.
(B) Analyzing the chemical composition of stars using spectroscopy.
(C) Predicting human behavior based on celestial positions.
(D) Testing the efficacy of a new drug using double-blind trials.
(E) Answer not known

33. The concept of scientific temper is most closely related to which of the following?
(A) Strict adherence to traditional customs and unquestioned dogmas.
(B) A mindset demanding evidence and logic for claims.
(C) The mental ability to memorize complex scientific laws and formulas.
(D) The legal protection of intellectual property and patent rights.
(E) Answer not known

34. Arrange the following historical scientific events in India in chronological order:
I. Launch of India's first satellite Aryabhata
II. Establishment of the Council of Scientific and Industrial Research (CSIR)
III. C.V. Raman winning the Nobel Prize in Physics
IV. Adoption of the first Scientific Policy Resolution
(A) III, II, I, IV
(B) III, II, IV, I
(C) II, III, IV, I

NODIA

(D) II, IV, III, I
(E) Answer not known

35. Consider the following statements regarding the societal role of science:
I. Science has significantly increased the global life expectancy through medical advancements.
II. Science creates an inherent bias against cultural diversity.
III. Scientific discoveries have revolutionized everyday transportation and communication.
IV. Science requires ethical boundaries to prevent the misuse of technological applications.
V. Science is an isolated endeavor that has no impact on socioeconomic policies.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, III, IV and V
(C) I, III and IV
(D) II, IV and V
(E) Answer not known

36. From the widespread adoption of 'Citizen Science' in modern research, one can infer that:
(A) Professional scientists are no longer required to conduct formal academic research.
(B) Scientific research funding is exclusively diverted to amateur and hobbyist researchers.
(C) Non-professionals contribute to data collection.
(D) Peer-review processes are entirely bypassed in all citizen science research projects.
(E) Answer not known

37. Which of the following is the primary advantage of conceptual learning over rote learning for competitive exam aspirants?
(A) Applying knowledge logically to unfamiliar questions.
(B) It requires significantly less time to complete the entire academic syllabus.
(C) It ensures the exact replication of textbook language in complex descriptive answers.
(D) It completely eliminates the need for any form of periodic revision.
(E) Answer not known

38. The term 'Interdisciplinary Science' refers to:
(A) Science that strictly adheres to the boundaries of a single traditional discipline.
(B) The study of conflicts occurring between scientists in different countries.
(C) Research that completely rejects all previous scientific methodologies.
(D) Integration of multiple scientific fields.
(E) Answer not known

39. The 'Technology Policy Statement' which aimed at technological self-reliance and the development of indigenous technology was issued in the year:
(A) 1958
(B) 1983
(C) 2003
(D) 2013
(E) Answer not known

40. The Department of Science and Technology (DST) was established in India to promote new areas of science and technology. In which year was it established?
(A) 1950
(B) 1965
(C) 1971
(D) 1985
(E) Answer not known

41. Consider the following statements regarding the characteristics of a scientific theory:
I. It is an educated guess made before any experimentation occurs.
II. It is widely accepted by the scientific community because it is supported by extensive evidence.
III. It can be modified or discarded if new evidence consistently contradicts it.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) II only
(E) Answer not known

42. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Superstitions often arise from a lack of scientific knowledge and rational thinking.

Click Here to Buy book on Amazon

Reason (R): Superstitions rely on assigning cause-and-effect relationships to unrelated events without empirical proof.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

43. Match the following elements of a research paper with their descriptions:

List I: (Element)
P. Abstract
Q. Methodology
R. Results
S. Bibliography

List II: (Description)
I. Details of the procedures and tools used in the experiment
II. Summary of the entire research study
III. List of references and prior works cited
IV. The raw data and statistical analysis findings

(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

44. Which of the following pairs is incorrectly matched regarding the branches of science?

(A) Bioinformatics - Application of computer technology to the management of biological information
(B) Nanotechnology - The study of the cosmos at a macro scale
(C) Geophysics - Study of the physical properties and processes of the Earth
(D) Metallurgy - The study of the physical and chemical behavior of metallic elements
(E) Answer not known

45. Identify the correct statement regarding the scientific method.

(A) Iterative process using observation and experiment.
(B) The scientific method guarantees that a hypothesis will eventually become a scientific law.
(C) The scientific method requires absolute consensus before a hypothesis can be tested.
(D) It is an unstructured approach that relies heavily on intuition rather than measurable data.
(E) Answer not known

46. Identify the incorrect statement regarding science education reforms in India.

(A) Science Olympiads are conducted to identify and nurture scientific talent among students.
(B) The INSPIRE program aims to attract talent to the study of science at an early age.
(C) ATL labs restrict students to textbook experiments.
(D) Emphasizing hands-on learning is a core strategy to reduce rote memorization in science.
(E) Answer not known

47. Which of the following represents the correct sequence for legally protecting a scientific invention?

(A) Patent Application, Invention Conception, Patent Grant, Prior Art Search
(B) Invention Conception, Prior Art Search, Patent Application, Patent Grant
(C) Prior Art Search, Patent Grant, Invention Conception, Patent Application
(D) Invention Conception, Patent Grant, Prior Art Search, Patent Application
(E) Answer not known

48. Consider the following statements regarding the Indian Space Research Organisation (ISRO):

I. It was formed in 1969 to harness space technology for national development.
II. Mangalyaan (MOM) made India the first Asian nation to reach Martian orbit.
III. ISRO functions exclusively under the Ministry of Defence.
IV. Chandrayaan-3 successfully demonstrated a soft landing on the lunar south pole.

Which of the above statement(s) is/are correct?

(A) I, II and IV
(B) I, III and IV
(C) II and III
(D) I, II and III
(E) Answer not known

NODIA

49. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): The scientific community has a profound responsibility towards environmental conservation.
Reason (R): Scientific advancements, while beneficial, can lead to environmental degradation if implemented without ecological considerations.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

50. Match the following Indian innovators with their associated scientific domain or institution:
List I: (Innovator)
P. Vikram Sarabhai
Q. Homi J. Bhabha
R. S.S. Bhatnagar
S. M.S. Swaminathan
List II: (Domain/Institution)
I. Nuclear Science Programme
II. Agricultural Science (Green Revolution)
III. Council of Scientific and Industrial Research (CSIR)
IV. Indian Space Programme
(A) P-IV, Q-I, R-III, S-II
(B) P-I, Q-IV, R-II, S-III
(C) P-IV, Q-III, R-I, S-II
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

51. Which of the following pairs is correctly matched regarding scientific terms?
(A) Control Group - Standard for comparisons.
(B) Independent Variable - The factor that is measured as the outcome of the experiment
(C) Dependent Variable - The factor that is intentionally manipulated by the experimenter
(D) Hypothesis - The final confirmed conclusion of a research study
(E) Answer not known

52. Which of the following is NOT considered a feature of critical thinking in science?
(A) Analyzing the source and reliability of evidence.
(B) Recognizing one's own biases during data interpretation.
(C) Blindly accepting hypotheses proposed by renowned scientists.
(D) Willingness to revise beliefs when confronted with new empirical data.
(E) Answer not known

53. Which of the following acts as the most appropriate strategy for identifying pseudoscience?
(A) Verifying if claims are testable and peer-reviewed.
(B) Checking if the claims use complex and advanced mathematical equations.
(C) Observing if the claims are popular on various social media platforms.
(D) Ensuring the claims align with ancient and historical mythological texts.
(E) Answer not known

54. Arrange the following achievements of ISRO in chronological sequence:
I. Launch of Mangalyaan (Mars Orbiter Mission)
II. Launch of Chandrayaan-1
III. Launch of Chandrayaan-3
IV. First successful launch of the Polar Satellite Launch Vehicle (PSLV)
(A) IV, II, I, III
(B) II, IV, I, III
(C) IV, I, II, III
(D) II, I, IV, III
(E) Answer not known

55. Consider the following statements regarding the interdisciplinary nature of modern science:
I. Bioinformatics merges biology, computer science, and information technology.
II. Biophysics applies the approaches and methods of physics to study biological systems.
III. Environmental science integrates physical, biological, and information sciences.
IV. Mechatronics combines mechanical engineering, electronics, and software engineering.
V. Classical taxonomy is completely isolated and never utilizes genetic sequencing.
Which of the above statement(s) is/are correct?

NODIA

(A) I, II, III and IV
(B) I, II, III and V
(C) II, III, IV and V
(D) I, III and IV
(E) Answer not known

56. A botanist observes that five different species of ferns in a rainforest thrive in high humidity. She concludes that all ferns require high humidity. This is an application of:
(A) Deductive reasoning
(B) Experimental control
(C) Inductive reasoning
(D) Pseudoscience
(E) Answer not known

57. The process of categorizing living organisms based on shared physical or genetic characteristics into groups like Kingdom, Phylum, and Class is primarily an example of:
(A) Deductive reasoning
(B) Rote memorization
(C) Pseudoscience
(D) Classification-based methodology.
(E) Answer not known

58. Which of the following best highlights the comparison between a scientific theory and a scientific law?
(A) Theory explains; Law describes.
(B) A theory is unproven, while a law is an absolute truth.
(C) A law explains why a phenomenon happens, while a theory describes what happens.
(D) Theories are derived from deductive reasoning, whereas laws use no reasoning.
(E) Answer not known

59. The primary feature of the 'Science Olympiads' organized in India is to:
(A) Provide physical sports training to science students.
(B) Identify talent in theoretical and experimental science.
(C) Fund large-scale industrial projects.
(D) Replace the standard board examinations.
(E) Answer not known

60. Using Newton's Law of Universal Gravitation to calculate the exact trajectory of a newly discovered comet is an example of:
(A) Inductive reasoning
(B) Deductive reasoning
(C) Forming a new hypothesis
(D) Citizen science
(E) Answer not known

61. Consider the following statements regarding Science Communication:
I. It aims to bridge the gap between complex scientific research and public understanding.
II. Effective science communication is essential for informed policy making.
III. It encourages the spread of scientific jargon to make science appear prestigious.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

62. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Celebrating National Science Day with a specific theme each year is redundant and wastes resources.
Reason (R): The themes focus public attention on critical contemporary issues like sustainable development or indigenous technologies.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

63. Match the following Government of India initiatives with their associated focus areas:
List I: (Initiative)
P. Start-up India
Q. INSPIRE
R. CSIR-NET
S. Chandrayaan
List II: (Focus Area)
I. Space exploration and lunar study
II. Promoting entrepreneurship and innovation
III. Attraction of talent to science careers at an early stage
IV. Eligibility test for Junior Research Fellowship and Lectureship

Downloaded from www.pdf.tube

(A) P-II, Q-III, R-IV, S-I
(B) P-III, Q-II, R-I, S-IV
(C) P-II, Q-IV, R-III, S-I
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

64. Which of the following pairs is correctly matched regarding the dimensions of science?
(A) Science as a process - The rigid belief in untested ancient scriptures
(B) Science as a human activity - The exclusion of all social impacts of discovery
(C) Science as a product - Established scientific knowledge.
(D) Science as a dogma - The continuous questioning of established theories
(E) Answer not known

65. The constitutional mandate under Article 51A(h) is most relevant to resolving which of the following social issues?
(A) Interstate water disputes
(B) Eradication of superstitions and blind faith.
(C) Allocation of national defense budgets
(D) Reorganization of state boundaries
(E) Answer not known

66. Based on the history of scientific discoveries, which of the following can be inferred about the nature of scientific laws?
(A) They are created by political mandates.
(B) They dictate how nature should behave rather than how it does behave.
(C) They are completely immune to revision even if contradicting data emerges.
(D) Descriptive generalizations based on empirical observations.
(E) Answer not known

67. Which of the following represents the correct hierarchical sequence of scientific knowledge from basic to advanced validation?
(A) Hypothesis, Observation, Theory, Law
(B) Observation, Hypothesis, Theory, Law
(C) Law, Theory, Hypothesis, Observation
(D) Theory, Law, Observation, Hypothesis
(E) Answer not known

68. Consider the following statements regarding the contributions of J.C. Bose:
I. He demonstrated that plants respond to various stimuli.
II. He invented the crescograph to measure plant growth.
III. He was a pioneer in the field of microwave radio optics.
IV. He strongly advocated for patenting all his inventions to acquire immense personal wealth.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II, III and IV
(D) I and II
(E) Answer not known

NODIA

69. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Science is inherently a human activity embedded in social and cultural contexts.
Reason (R): Scientific priorities and funding are often influenced by the societal needs and cultural values of the time.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

70. Match the following Nobel Prize winners in Science with their core discovery:
List I: (Scientist)
P. C.V. Raman
Q. Har Gobind Khorana
R. S. Chandrasekhar
S. Venkatraman Ramakrishnan
List II: (Discovery)
I. Interpretation of the genetic code
II. Structure and function of the ribosome
III. Evolutionary stages of massive stars
IV. Scattering of light
(A) P-IV, Q-I, R-III, S-II
(B) P-I, Q-IV, R-II, S-III
(C) P-IV, Q-III, R-I, S-II
(D) P-III, Q-II, R-IV, S-I
(E) Answer not known

71. Which of the following pairs is incorrectly matched regarding scientific attitudes?

(A) Open-mindedness - Willingness to change views in light of new evidence
(B) Objectivity - Relying entirely on personal emotions to interpret data
(C) Skepticism - Questioning the validity of claims lacking evidence
(D) Curiosity - The desire to investigate and understand natural phenomena
(E) Answer not known

72. A key advantage of applying scientific principles in agriculture (such as in the Green Revolution) is:
(A) Complete elimination of all organic farming methods
(B) Drastic reduction in crop yields to preserve soil
(C) Development of high-yielding crop varieties.
(D) Increased dependency on superstitious planting rituals
(E) Answer not known

73. Which of the following definitions best describes 'Innovation' in a scientific and economic context?
(A) The act of copying existing technologies without permission.
(B) A theoretical framework that has not yet been practically tested.
(C) The discovery of a pre-existing natural phenomenon.
(D) Translating an idea into a value-creating service.
(E) Answer not known

74. Arrange the following steps typically involved in the development of a DRDO defence system in the correct logical sequence:
I. Field Trials and User Testing
II. Requirement Analysis and Conceptualization
III. Induction into the Armed Forces
IV. Prototype Manufacturing
(A) II, IV, I, III
(B) IV, II, III, I
(C) II, I, IV, III
(D) I, II, IV, III
(E) Answer not known

75. Consider the following statements regarding India's Technology Policy Statement (TPS):
I. It was introduced in 1983.
II. Its primary objective was to attain technological competence and self-reliance.
III. It emphasized the development of indigenous technology.
IV. It completely banned the import of all foreign technologies.
V. It promoted the efficient absorption and adaptation of imported technology.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) I, II, III and IV
(C) II, III, IV and V
(D) I, III and IV
(E) Answer not known

76. The Atal Innovation Mission (AIM), which runs the Atal Tinkering Labs in schools, is an initiative established by which organization?
(A) ISRO
(B) NITI Aayog
(C) DRDO
(D) CSIR
(E) Answer not known

77. The Shanti Swarup Bhatnagar Prize, one of the highest multidisciplinary science awards in India, is awarded annually by which institution?
(A) CSIR
(B) Indian Space Research Organisation (ISRO)
(C) Department of Biotechnology (DBT)
(D) Indian Council of Medical Research (ICMR)
(E) Answer not known

78. Identify the correct statement regarding 'Plagiarism' in scientific research.
(A) Plagiarism is the ethical practice of building upon previous research.
(B) Plagiarism occurs only when data is falsified in a laboratory.
(C) Presenting work without proper attribution.
(D) Plagiarism is legally required to patent an invention in India.
(E) Answer not known

79. Identify the incorrect statement regarding the Constitution of India and science.
(A) The Constitution promotes the development of scientific temper through Fundamental Duties.
(B) Scientific inquiry is viewed as a duty of

Click Here to Buy book on Amazon

every citizen of India.
(C) The promotion of humanism is clubbed together with scientific temper in the Constitution.
(D) Article 51A(h) is a legally enforceable right for science funding.
(E) Answer not known

80. Which of the following is NOT a characteristic of a valid scientific theory?
(A) It must be testable and falsifiable.
(B) It must be consistent with pre-existing experimental results.
(C) It must rely strictly on supernatural explanations.
(D) It must make predictions that can be verified by further observation.
(E) Answer not known

81. Consider the following statements regarding the role of government in science:
I. Governments formulate policies to direct research towards national goals.
II. Public funding is crucial for basic science research that may not have immediate commercial value.
III. Government regulations ensure ethical standards are maintained in clinical trials.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I, II and III
(E) Answer not known

82. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Pseudoscience can be harmful to society, especially in the fields of health and medicine.
Reason (R): Relying on unverified pseudoscientific treatments can cause patients to delay or reject proven medical therapies.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

83. Match the following terms with their corresponding definitions in the context of scientific reasoning:
List I: (Term)
P. Inference
Q. Paradigm
R. Falsifiability
S. Empiricism
List II: (Definition)
I. The capacity for a hypothesis to be proven wrong
II. A widely accepted framework or model in science
III. Knowledge derived strictly from sensory experience and observation
IV. A logical conclusion drawn from available evidence
(A) P-IV, Q-II, R-I, S-III
(B) P-I, Q-III, R-IV, S-II
(C) P-IV, Q-I, R-II, S-III
(D) P-II, Q-IV, R-III, S-I
(E) Answer not known

84. Which of the following pairs is correctly matched regarding everyday kitchen phenomena?
(A) Browning of cut apples - Condensation of water vapor
(B) Sour taste of lemon - High concentration of base (alkali)
(C) Tearing from onions - Sulfur compound release.
(D) Boiling of water - A purely chemical change
(E) Answer not known

85. The most fundamental prerequisite for beginning a scientific investigation is:
(A) Asking a specific, testable question.
(B) Publishing a peer-reviewed research paper.
(C) Obtaining a legally binding commercial patent.
(D) Memorizing all established and known laws of physics.
(E) Answer not known

86. An agricultural researcher in Tamil Nadu uses a new genetic sequencing tool developed by the Department of Biotechnology (DBT) to identify drought-resistant rice genes. This is a direct application of:
(A) Pseudoscience
(B) Classical taxonomy

(C) Inductive logic in mathematics
(D) Biotechnology in agriculture
(E) Answer not known

87. Which of the following represents the correct sequence in the lifecycle of a technology start-up?
(A) Seed Funding, Ideation, Market Expansion, Prototype Development
(B) Ideation, Prototype Development, Seed Funding, Market Expansion
(C) Market Expansion, Ideation, Seed Funding, Prototype Development
(D) Prototype Development, Seed Funding, Ideation, Market Expansion
(E) Answer not known

88. Consider the following statements regarding the interdisciplinary nature of science:
I. Real-world problems like climate change cannot be solved by a single scientific discipline.
II. Convergence of disciplines leads to the emergence of new fields like biochemistry.
III. Strict separation of biology, chemistry, and physics accelerates modern innovation.
IV. Interdisciplinary collaboration is highly discouraged in top institutions like CSIR.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I, II and III
(C) II and IV
(D) I and IV
(E) Answer not known

89. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Conceptual learning is considered superior to rote learning in modern science education.
Reason (R): Conceptual learning helps students understand the "why" and "how" of phenomena, enabling better application of knowledge.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

90. Match the following pseudoscientific practices with their core claims:
List I: (Practice)
P. Phrenology
Q. Alchemy
R. Astrology
S. Homeopathy
List II: (Claim)
I. Transmuting base metals into noble metals like gold
II. Determining personality traits based on the shape of the skull
III. Curing ailments using highly diluted substances that cause the symptoms
IV. Predicting human events based on the position of celestial bodies
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

91. Which of the following pairs is incorrectly matched regarding Indian scientific institutions and their jurisdiction?
(A) ISRO - Department of Space
(B) CSIR - Ministry of Health
(C) DRDO - Ministry of Defence
(D) DBT - Ministry of Science and Technology
(E) Answer not known

92. The primary sources of valid scientific knowledge are classified as:
(A) Anecdotal accounts and myths
(B) Empirical observation and experiment.
(C) Astrological charts and horoscopes
(D) Rote memorization of ancient texts
(E) Answer not known

93. When comparing a hypothesis to a theory in science, the primary distinction is that:
(A) Hypothesis is tentative; Theory is substantiated.
(B) A hypothesis is a widely accepted explanation, while a theory is a wild guess.
(C) Hypotheses are used only in biology, while theories are used only in physics.
(D) There is no distinction; the terms are perfectly synonymous.
(E) Answer not known

Downloaded from www.pdf.tube

94. Arrange the steps involved in establishing a scientific law from a raw observation:
I. Repeated independent testing yielding consistent results
II. Initial Observation of a natural phenomenon
III. Formulation of a Hypothesis
IV. Establishment of a Scientific Law
(A) II, III, I, IV
(B) III, II, I, IV
(C) II, I, III, IV
(D) I, II, III, IV
(E) Answer not known

95. Consider the following statements regarding the challenges and reforms in Science Education in India:
I. Lack of adequate laboratory infrastructure in rural schools is a major challenge.
II. The shift towards competency-based learning is a key reform under NEP 2020.
III. Promoting experiential learning to reduce rote memorization is highly emphasized.
IV. The curriculum strictly discourages students from participating in Science Olympiads.
V. Integrating regional languages into science teaching is viewed as a measure to improve understanding.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) I, II, IV and V
(C) II, III, IV and V
(D) I, III and IV
(E) Answer not known

96. Which of the following highlights a prominent feature of women breaking stereotypes in Indian science?
(A) They are restricted strictly to theoretical research.
(B) They are legally barred from filing patents in India.
(C) Leading missions as Project Directors.
(D) Their contributions are predominantly limited to the 19th century.
(E) Answer not known

97. Which of the following is a classic example of a 'Citizen Science' tool?
(A) A highly classified DRDO missile launch code.
(B) Birdwatching apps for tracking patterns.
(C) A multibillion-dollar particle accelerator like the Large Hadron Collider.
(D) A confidential corporate patent document.
(E) Answer not known

98. The most relevant role of research integrity and ethics in science is to:
(A) Ensure the data is altered to confirm the scientist's beliefs.
(B) Prevent young scientists from publishing their work.
(C) Keep scientific discoveries hidden from the general public.
(D) Maintain credibility and protect subjects.
(E) Answer not known

99. From the growing prevalence of vaccine hesitancy driven by misinformation on social media, one can infer that:
(A) Communication and public understanding are urgent.
(B) Science communication to the public is ineffective and should be abandoned.
(C) Pseudoscience always provides better health outcomes than modern medicine.
(D) The scientific method is fundamentally flawed.
(E) Answer not known

100. A major advantage of participating in Science Olympiads for a student is:
(A) Guaranteed admission into medical colleges without any entrance exams.
(B) Acquiring the right to bypass university degrees entirely.
(C) Higher-order thinking and problem-solving.
(D) Complete exemption from studying humanities or languages.
(E) Answer not known

101. Consider the following features of Critical Thinking:
I. Evaluating evidence and arguments objectively.
II. Relying solely on emotional responses to form conclusions.
III. Identifying logical fallacies in a given statement.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III

NODIA

(C) I and III
(D) I only
(E) Answer not known

102. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Many ancient Indian scientific contributions, such as zero and the decimal system, form the bedrock of modern mathematics.
Reason (R): These concepts were integrated into the global knowledge pool through transmission via Arab scholars to Europe.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

103. Match the following scientists with strong Tamil Nadu connections to their associated fields:
List I: (Scientist)
P. Sir C.V. Raman
Q. Srinivasa Ramanujan
R. Dr. V. Shanta
S. Dr. M.S. Swaminathan
List II: (Field)
I. Oncology and Cancer care
II. Number Theory and Infinite Series
III. Agricultural Science and Genetics
IV. Optics and Light Scattering
(A) P-IV, Q-II, R-I, S-III
(B) P-I, Q-IV, R-II, S-III
(C) P-IV, Q-III, R-I, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

104. Which of the following pairs regarding research misconduct is correctly matched?
(A) Falsification - Giving proper credit to previous researchers
(B) Plagiarism - Manipulating research materials or equipment
(C) Fabrication - Reporting made-up data.
(D) Peer Review - Stealing someone else's hypothesis secretly
(E) Answer not known

105. Pseudoscience is strictly defined by its lack of:
(A) Complex terminology
(B) Passionate followers
(C) Historical origins
(D) Falsifiability and empirical testing.
(E) Answer not known

106. Who was the first Indian to win the Nobel Prize in Physics?
(A) Sir C.V. Raman
(B) Homi J. Bhabha
(C) Satyendra Nath Bose
(D) Subrahmanyan Chandrasekhar
(E) Answer not known

107. Which of the following is the correct sequence of the operational launch vehicles developed by ISRO, from earliest to latest?
(A) SLV-3, ASLV, PSLV, GSLV
(B) ASLV, SLV-3, GSLV, PSLV
(C) PSLV, SLV-3, ASLV, GSLV
(D) SLV-3, PSLV, ASLV, GSLV
(E) Answer not known

108. Consider the following statements regarding the importance of Science Communication:
I. It helps demystify scientific jargon for the common person.
II. It promotes scientific temper and combats superstitions.
III. It is solely the responsibility of journalists, not scientists.
IV. It enables citizens to make informed decisions regarding health and environment.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) II, III and IV
(D) I, II and III
(E) Answer not known

109. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Science and technology exhibit a relationship of mutual dependence.
Reason (R): Scientific discoveries often lead to new technologies, and advanced technologies enable deeper scientific research (e.g., microscopes and microbiology).
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct

Click Here to Buy book on Amazon

explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

110. Match the following 'Revolutions' in India with the application of science they represent:
List I: (Revolution)
P. Green Revolution
Q. White Revolution
R. Blue Revolution
S. Yellow Revolution
List II: (Application)
I. Milk and Dairy production
II. Oilseeds production
III. Wheat and Rice production
IV. Fish and Aquaculture production
(A) P-III, Q-I, R-IV, S-II
(B) P-I, Q-III, R-II, S-IV
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-I, R-III, S-II
(E) Answer not known

111. Which of the following pairs is incorrectly matched regarding the goals of disciplines?
(A) Science - To understand natural phenomena
(B) Technology - To apply scientific knowledge for practical uses
(C) Engineering - To design and build structures or systems
(D) Superstition - To conduct rigorous empirical experiments
(E) Answer not known

112. The National Science Day (February 28) marks the date when:
(A) Sir C.V. Raman was awarded the Nobel Prize
(B) The CSIR was officially formed
(C) Raman Effect discovery announced.
(D) The Indian Constitution adopted Article 51A(h)
(E) Answer not known

113. Identify the correct statement regarding the duration of a patent in India under the Patents Act.
(A) The term of every patent granted is 10 years from the date of filing.
(B) The term of every patent granted is 20 years from the date of filing.
(C) A patent once granted is valid for the lifetime of the inventor.
(D) Patents in India are valid for a maximum of 5 years.
(E) Answer not known

114. Arrange the logical steps of Deductive Reasoning in the correct sequence:
I. Formulate a specific conclusion
II. Identify a general premise or theory
III. State a secondary/minor premise
(A) II, III, I
(B) III, II, I
(C) I, II, III
(D) II, I, III
(E) Answer not known

115. Consider the following statements regarding the environmental responsibility of the scientific community:
I. Developing sustainable green technologies is a primary environmental responsibility.
II. Assessing the ecological impact of new chemical fertilizers before widespread use.
III. Promoting fossil fuel dependency to accelerate short-term industrial growth.
IV. Innovating in the field of renewable energy sources like solar and wind.
V. Advising policymakers on the mitigation of climate change.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V
(B) I, III, IV and V
(C) II, III, IV and V
(D) I, II, III and IV
(E) Answer not known

116. Identify the incorrect statement regarding the perceived advantages of rote learning.
(A) It can be useful for memorizing basic alphabets or multiplication tables at an early age.
(B) It helps in rapid recall of static, unchanging facts in a short time.
(C) Foundational ability to critique and analyze.
(D) It requires minimal instructional design compared to conceptual teaching.
(E) Answer not known

117. Which of the following is NOT an example of an interdisciplinary science?
(A) Pure theoretical topology

Downloaded from www.pdf.tube

(B) Biochemistry
(C) Astrobiology
(D) Geophysics
(E) Answer not known

118. The most appropriate main goal of the Atal Innovation Mission (AIM) is to:
(A) Directly fund national defense budgets.
(B) Regulate the agricultural market prices.
(C) Take over the operations of the Indian Space Research Organisation.
(D) Promote innovation and entrepreneurship ecosystem.
(E) Answer not known

119. Promoting public debates on scientific issues, fact-checking viral social media health claims, and encouraging skepticism are applications of:
(A) Promoting Rote Learning
(B) Establishing Scientific Temper in society
(C) Fostering Pseudoscience
(D) Enforcing strict patent laws
(E) Answer not known

120. DRDO (Defence Research and Development Organisation) primarily researches and classifies its work into areas such as:
(A) Deep-sea fish breeding and agriculture
(B) Educational pedagogy and school curricula
(C) Aeronautics, Armaments, Electronics, and Missiles.
(D) Ancient philosophical texts and mythology
(E) Answer not known

121. Consider the following statements regarding Science and Culture:
I. Science shapes culture by challenging old dogmas and introducing new worldviews.
II. Cultural values can influence the direction and ethical boundaries of scientific research.
III. Science and culture are completely mutually exclusive and never interact.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

122. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): A core characteristic of scientific knowledge is that it is testable.
Reason (R): If a claim cannot be tested through observation or experimentation, it lies outside the realm of science.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

123. Match the following CSIR laboratories located in Tamil Nadu with their respective focus areas:
List I: (Laboratory)
P. CLRI (Chennai)
Q. CECRI (Karaikudi)
R. SERC (Chennai)
List II: (Focus Area)
I. Structural Engineering
II. Electrochemical Science
III. Leather Research
(A) P-III, Q-II, R-I
(B) P-I, Q-III, R-II
(C) P-II, Q-I, R-III
(D) P-III, Q-I, R-II
(E) Answer not known

NODIA

124. Which of the following pairs correctly matches a superstition with its rational scientific explanation?
(A) Breaking a mirror brings 7 years of bad luck - Glass possesses magical time-altering properties
(B) Eclipses emit poisonous rays - The moon simply blocks sunlight causing temporary darkness
(C) Lemon and chilli ward off evil - Evil spirits are allergic to Vitamin C
(D) Comets cause famines - Comets absorb atmospheric moisture from space
(E) Answer not known

125. When comparing Inductive and Deductive reasoning, which statement is true?
(A) Induction moves from specific to general.
(B) Inductive reasoning guarantees a completely certain conclusion, while deductive does not.
(C) Deductive reasoning relies entirely on

creating new observations rather than using existing theories.
(D) Both reasoning types explicitly reject the scientific method.
(E) Answer not known

126. A prominent feature of a scientific theory is that it is:
(A) An educated guess made prior to data collection.
(B) A rigid truth that is absolutely immune to new conflicting evidence.
(C) Substantiated explanation tested and acquired.
(D) Only valid if formulated by a recognized scientific institution.
(E) Answer not known

127. Which of the following sequences represents the correct method of hypothesis testing?
(A) Formulate Hypothesis, Collect Data, Analyze Data, Draw Conclusion
(B) Collect Data, Draw Conclusion, Formulate Hypothesis, Analyze Data
(C) Analyze Data, Formulate Hypothesis, Draw Conclusion, Collect Data
(D) Draw Conclusion, Collect Data, Analyze Data, Formulate Hypothesis
(E) Answer not known

128. Consider the following statements regarding the role of women in Indian science:
I. Women scientists played critical roles as Project Directors in the Chandrayaan-2 mission.
II. Dr. Gagandeep Kang was the first Indian woman scientist to be elected as a Fellow of the Royal Society.
III. The participation of women in STEM fields in India has been steadily decreasing since independence.
IV. 'KIRAN' (Knowledge Involvement in Research Advancement through Nurturing) is an initiative to support women scientists.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) II, III and IV
(D) I, II and III
(E) Answer not known

129. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Modern scientific research increasingly requires an interdisciplinary approach.
Reason (R): Complex global challenges, such as pandemics and climate change, cannot be understood through the lens of a single scientific discipline.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

130. Match the following historical texts of India with their primary scientific discipline:
List I: (Text)
P. Surya Siddhanta
Q. Charaka Samhita
R. Sulba Sutras
S. Vaisheshika Sutra
List II: (Discipline)
I. Geometry and Mathematics
II. Early concepts of atoms (Anu)
III. Astronomy
IV. Medicine and Ayurveda
(A) P-III, Q-IV, R-I, S-II
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-I, R-IV, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

131. Which of the following pairs is incorrectly matched regarding India's Science Policies?
(A) Scientific Policy Resolution - 1958
(B) Technology Policy Statement - 1983
(C) Science and Technology Policy - 2003
(D) STIP Policy - 1990.
(E) Answer not known

132. Which of the following is an example of a modern Indian innovation bridging science and entrepreneurship?
(A) The formulation of Ayurveda.
(B) The discovery of zero.
(C) Low-cost generic drugs and vaccines.
(D) The architectural design of ancient temples.
(E) Answer not known

Click Here to Buy book on Amazon

133. The most relevant factor driving a scientist to continuously question existing paradigms and seek new knowledge is:
(A) Intellectual curiosity and inquiry spirit.
(B) The pursuit of rote memorization.
(C) A desire to enforce dogmatic beliefs.
(D) Political pressure to confirm biases.
(E) Answer not known

134. Arrange the steps of the Inductive Reasoning process in the correct order:
I. Detect a pattern or regularity
II. Formulate a tentative hypothesis
III. Make specific observations
IV. Develop a general theory or conclusion
(A) III, I, II, IV
(B) I, II, III, IV
(C) III, II, I, IV
(D) II, III, I, IV
(E) Answer not known

135. Consider the following statements regarding the 'Startup India' initiative:
I. It aims to build a strong ecosystem for nurturing innovation and startups.
II. It provides a patent facilitation scheme to help startups file patents at reduced costs.
III. It strictly funds only IT-based startups, excluding biotechnology or hardware.
IV. It encourages entrepreneurship leading to economic growth and job creation.
V. It offers tax exemptions for eligible startups for a certain period.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V
(B) I, II, III and V
(C) II, III, IV and V
(D) I, III, IV and V
(E) Answer not known

136. If a scientist systematically records the daily temperature and humidity changes in a specific region over 10 years without altering the environment, this process is best inferred as:
(A) An experiment
(B) A theoretical deduction
(C) An observation
(D) An ethical violation
(E) Answer not known

137. What is the primary advantage of incorporating scientific principles into national policy making?
(A) It eliminates the need for any democratic voting process.
(B) It makes the policies incomprehensible to the general public.
(C) It completely bypasses all economic considerations.
(D) Policies based on empirical data analysis.
(E) Answer not known

138. Which of the following best defines a 'Hypothesis' in science?
(A) Tentative, testable phenomenon explanation.
(B) An unquestionable scientific law.
(C) The final data collected during an experiment.
(D) A historical account of a scientific discovery.
(E) Answer not known

139. Which apex public policy think tank of the Government of India oversees the Atal Innovation Mission (AIM)?
(A) Ministry of Earth Sciences
(B) NITI Aayog
(C) University Grants Commission (UGC)
(D) Science and Engineering Research Board (SERB)
(E) Answer not known

140. Identify the factual statement regarding the INSPIRE scheme in India.
(A) It provides pensions to retired scientists.
(B) Innovation in Science Pursuit for Inspired Research.
(C) It is exclusively for students pursuing Arts and Humanities.
(D) It was launched by the Indian Space Research Organisation.
(E) Answer not known

NODIA

141. Consider the following statements regarding the limitations of Science:
I. Science cannot make moral or aesthetic judgments.
II. Science cannot provide absolute proof, only high degrees of probability based on evidence.
III. Science is ill-equipped to answer questions regarding the ultimate meaning or purpose

of life.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I, II and III
(E) Answer not known

142. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Developing a scientific temper naturally leads to conflict with superstitions.
Reason (R): Scientific temper relies on questioning and evidence, whereas superstitions demand blind faith without evidence.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

143. Match the everyday kitchen substances with their chemical nature:
List I: (Substance)
P. Baking Soda
Q. Vinegar
R. Table Salt
S. Lemon Juice
List II: (Chemical Nature)
I. Sodium Chloride
II. Acetic Acid
III. Citric Acid
IV. Sodium Bicarbonate
(A) P-IV, Q-II, R-I, S-III
(B) P-II, Q-IV, R-III, S-I
(C) P-IV, Q-I, R-II, S-III
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

144. Which of the following pairs is correctly matched regarding Indian engineering and technological achievements?
(A) BrahMos - A purely indigenous, non-collaborative space satellite
(B) Tejas - A nuclear-powered submarine
(C) Param 8000 - India's first supercomputer
(D) INS Arihant - India's first light combat aircraft
(E) Answer not known

145. Identify the correct statement regarding the importance of experimentation in science.
(A) Experimentation is used to conclusively prove a hypothesis beyond any future doubt.
(B) Isolate variables and establish causes.
(C) Experimentation is merely a theoretical exercise that requires no physical tools.
(D) Experimentation relies solely on observing nature without any human intervention.
(E) Answer not known

146. Identify the incorrect statement regarding the characteristics of pseudoscience.
(A) It heavily relies on anecdotal evidence and personal testimonies.
(B) It often uses scientific-sounding jargon to appear legitimate.
(C) It avoids making precise, falsifiable predictions.
(D) It welcomes peer review and testing.
(E) Answer not known

147. Which of the following sequences best describes the progress of a scientific paradigm according to modern philosophy of science?
(A) Normal Science, Anomalies, Crisis, Paradigm Shift
(B) Crisis, Normal Science, Paradigm Shift, Anomalies
(C) Paradigm Shift, Normal Science, Crisis, Anomalies
(D) Anomalies, Paradigm Shift, Normal Science, Crisis
(E) Answer not known

148. Consider the following statements regarding the benefits of Citizen Science:
I. It enables the collection of large-scale geographical data that would be impossible for a single research team.
II. It democratizes science by involving the public in the scientific process.
III. It guarantees that all collected data will be completely free of errors.
IV. It raises environmental awareness and scientific literacy among participants.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) II, III and IV
(D) I, II and III

Downloaded from www.pdf.tube

(E) Answer not known

149. Identify the correct option based on the assertion and reason statements provided below.
Assertion (A): Ethics in modern technology strongly debate the responsible use of Artificial Intelligence (AI).
Reason (R): Unregulated AI algorithms can perpetuate biases, compromise data privacy, and lack transparency.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

150. Match the following scientists with the discoveries/theories they are most renowned for:
List I: (Scientist)
P. Satyendra Nath Bose
Q. Meghnad Saha
R. G.N. Ramachandran
S. Yellapragada Subbarow
List II: (Discovery)
I. Thermal ionization equation
II. Bose-Einstein statistics
III. Synthesis of ATP and Aureomycin
IV. Ramachandran plot for protein structures
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

151. Which of the following pairs is incorrectly matched regarding Start-up terminology?
(A) Incubator - Helps early-stage startups develop their ideas into viable products
(B) Bootstrapping - Relying on heavy subsidies.
(C) Angel Investor - An individual who provides capital for a business start-up, usually in exchange for convertible debt or ownership equity
(D) Unicorn - A privately held startup company valued at over $1 billion
(E) Answer not known

152. Which of the following is NOT considered a core step in the scientific method?
(A) Asking a question based on observation
(B) Formulating a hypothesis
(C) Appealing to traditional authority for validation
(D) Conducting an experiment
(E) Answer not known

NODIA

153. The most effective approach for a government to eradicate superstitions among its citizens is to:
(A) Ban all religious institutions entirely.
(B) Ignore them as harmless cultural practices.
(C) Arrest citizens who practice astrology.
(D) Integrate conceptual learning in schools.
(E) Answer not known

154. Arrange the steps of conducting a controlled scientific experiment in the correct order:
I. Define the independent and dependent variables
II. Set up the control group and experimental group
III. Record the data observed during the experiment
IV. Analyze the data to see if it supports the hypothesis
(A) I, II, III, IV
(B) II, I, III, IV
(C) I, III, II, IV
(D) II, III, I, IV
(E) Answer not known

155. Consider the following statements regarding the impact of scientific discoveries on human life:
I. The discovery of antibiotics revolutionized medicine and drastically reduced mortality rates from bacterial infections.
II. The invention of the transistor laid the foundation for modern electronics and computers.
III. Scientific advancements in agriculture have ensured absolute global food security with zero hunger anywhere in the world.
IV. Discoveries in thermodynamics paved the way for the Industrial Revolution.
V. The mapping of the human genome has opened new avenues for personalized medicine.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V

(B) I, II, III and V
(C) II, III, IV and V
(D) I, III, IV and V
(E) Answer not known

156. A group claims they have created a machine that generates more energy than it consumes (perpetual motion), defying the laws of thermodynamics. As a student with scientific temper, your immediate application of reasoning should be to:
(A) Invest all your savings into the machine.
(B) Demand empirical data and verification.
(C) Believe the claim because advanced technology looks like magic.
(D) Assume thermodynamics is completely wrong without seeing the machine.
(E) Answer not known

157. Patents, Copyrights, and Trademarks are classified under which broad category?
(A) Intellectual Property Rights (IPR)
(B) Tangible Physical Assets
(C) Scientific Theories
(D) Pseudoscience tools
(E) Answer not known

158. When comparing Science with Pseudoscience, the crucial differentiator is that:
(A) Science uses only ancient texts, whereas pseudoscience uses modern laboratories.
(B) Science is always easy to understand, while pseudoscience requires complex math.
(C) Science embraces falsifiability and criticism.
(D) Pseudoscience updates its core theories constantly, while science never changes.
(E) Answer not known

159. A prominent feature of good science communication is:
(A) Using excessive jargon to ensure only experts understand.
(B) Sensationalizing results to create panic and gain viewership.
(C) Withholding the methodology and limitations of the study.
(D) Accurate, engaging, and accessible formats.
(E) Answer not known

160. An educator explaining the concept of gravity by dropping two objects of different masses simultaneously in the classroom is an example of:
(A) Promoting rote learning and the practice of blind memorization.
(B) Engaging in various forms of unverified pseudoscientific practices.
(C) Applying experiential learning for scientific laws.
(D) Teaching a scientific theory without any form of empirical backing.
(E) Answer not known

www.nodia.in

Click Here to Buy book on Amazon

ANSWERS

1. (C) I and III
Deductive reasoning starts with general principles to reach specific, logical conclusions. If the initial premises are true and the logical structure is valid, the resulting conclusion is guaranteed to be true. Unlike inductive reasoning, which is used for theory formulation, deduction is primarily applied to test existing theories or predict specific outcomes based on established laws and principles.

2. (C) A is true but R is false.
Article 51A(h) of the Indian Constitution lists the development of scientific temper, humanism, and the spirit of inquiry as a fundamental duty for citizens. While this encourages rational thinking and questioning, it does not aim to eradicate religion. Scientific temper focuses on applying logical reasoning and evidence to distinguish facts from baseless claims or harmful superstitions within society.

3. (A) P-IV, Q-I, R-II, S-III
India maintains several specialized research institutions. The Council of Scientific and Industrial Research focuses on industrial applications. The Indian Space Research Organisation handles space exploration and satellite technology. The Defence Research and Development Organisation develops military systems. Finally, the Department of Biotechnology promotes research in life sciences and biotechnology. This division ensures comprehensive growth across various scientific and technological domains.

4. (C) J.C. Bose - Plant neurobiology and wireless communication
Jagadish Chandra Bose was a polymath who pioneered the investigation of radio and microwave optics. He made significant contributions to plant science by demonstrating that plants possess a sensitivity to stimuli similar to animals. His invention of the crescograph allowed for the measurement of plant growth, establishing him as a founder of modern plant neurobiology and wireless communication research.

5. (A) A collection of beliefs or practices mistakenly regarded as being based on scientific method.
Pseudoscience consists of beliefs, theories, or practices that claim to be scientific but lack the rigorous methodology and empirical evidence required by the scientific method. These claims are often characterized by vague, exaggerated, or untestable assertions and a lack of openness to peer review. Unlike genuine science, pseudoscience does not update its conclusions when confronted with contradictory evidence.

6. (D) The discovery of the Raman Effect
National Science Day is celebrated annually on February 28 to mark the anniversary of the discovery of the Raman Effect by Sir C.V. Raman in 1928. This discovery, which involves the scattering of light by matter, earned him the Nobel Prize in Physics. The day serves to acknowledge his contribution and encourage scientific curiosity among the Indian public.

7. (A) Observation, Hypothesis, Experiment, Conclusion
The scientific method follows a logical progression to investigate natural phenomena. It begins with observing a specific occurrence and formulating a testable hypothesis to explain it. Subsequently, experiments are conducted to gather data and test the hypothesis's validity. Finally, researchers analyze the results to draw a conclusion that either supports or refutes the initial idea, ensuring objective knowledge acquisition.

8. (B) I, III and IV
Rote learning relies on the mechanical memorization of facts without understanding their underlying principles or logic. This approach actively discourages critical thinking and problem-solving skills, as students do not engage with the material conceptually. Consequently, learners often struggle to apply their knowledge to new or unfamiliar situations. It fails to build

NODIA

the deep understanding necessary for advanced scientific inquiry.

9. (C) A is true but R is false.
A scientific theory is an extensive, well-substantiated explanation of natural phenomena based on a vast body of evidence. However, a theory does not become a law simply through repeated proof. Laws describe what happens under specific conditions, usually through mathematical relationships, while theories explain the underlying mechanisms of why things happen. They are distinct types of scientific knowledge.

10. (A) P-II, Q-IV, R-I, S-III
Different learning frameworks define how knowledge is acquired and used. Rote learning involves memorization without comprehension, while conceptual learning connects new ideas to existing frameworks. Critical thinking requires the objective analysis and evaluation of information to form judgments. Finally, scientific temper is a mindset characterized by questioning assumptions and seeking rational, evidence-based explanations for various phenomena in the world.

11. (B) Hypothesis - A proven fact that cannot be challenged
A hypothesis is a tentative and testable explanation for an observation, rather than a proven fact. In scientific inquiry, it serves as a starting point for further investigation and must be capable of being proven wrong through experimentation. Genuine scientific inquiry treats hypotheses as flexible propositions that are subject to rigorous testing, modification, or rejection based on the collected empirical data.

12. (B) 1958
The Government of India adopted the first Scientific Policy Resolution in 1958. This landmark document aimed to cultivate scientific research in all its aspects—pure, applied, and educational. It emphasized the importance of fostering a scientific temper among the population and recognized science and technology as vital tools for national development, social transformation, and economic growth in post-independence India.

13. (A) Knowledge based on empirical data and subject to revision.
Scientific knowledge is fundamentally based on empirical data derived from observation and experimentation. One of its defining characteristics is its tentative nature; it is always subject to revision or refinement as new evidence emerges or better explanations are developed. This openness to change ensures that science remains a self-correcting process, moving closer to an accurate understanding of the natural world.

14. (A) II, IV, III, I
The process of fostering innovation follows a logical path from conception to the market. It starts with idea generation, followed by rigorous research and development to refine the concept. After a prototype is created, it undergoes extensive testing to ensure functionality and safety. The final stage is commercialization, where the product or service is made available for public or industrial use.

15. (B) I, II, III and V
Dr. A.P.J. Abdul Kalam made immense contributions to India's scientific landscape. He played a key role in the civilian space programme as the project director of SLV-III and led the development of indigenous missile technology. Although he was a renowned aerospace engineer and scientist, he did not win a Nobel Prize. He was also a dedicated educator.

16. (C) Subrahmanyan Chandrasekhar was awarded the Nobel Prize for his discoveries concerning plant neurobiology.
Subrahmanyan Chandrasekhar was awarded the Nobel Prize in Physics in 1983 for his theoretical studies on the physical processes important to the structure and evolution of stars. His work established the Chandrasekhar Limit regarding white dwarfs. He was not involved in plant neurobiology; that field is more closely associated with the research conducted by Jagadish Chandra Bose.

17. (B) To restrict scientific research exclusively to PhD-holding professionals.
Citizen science aims to democratize the scientific process by involving the general public in data collection and analysis. It seeks to enhance

NODIA

public awareness of scientific methods and build large-scale datasets for research, such as environmental monitoring. Restricting research exclusively to professionals with advanced degrees would contradict these goals, as the movement values the contributions of volunteers and non-professional enthusiasts.

18. (D) Science understands the natural world; technology applies that knowledge.
Science is a systematic endeavor that seeks to understand the laws and principles governing the natural world through observation and experimentation. In contrast, technology is the practical application of this scientific knowledge for functional purposes, such as creating tools, systems, or processes to solve problems. While science focuses on discovering the "why" and "how," technology focuses on utilizing that understanding.

19. (A) Concept application of science in everyday life
Observing bread dough rise due to the addition of yeast is a practical example of applying biological concepts to everyday life. This phenomenon demonstrates fermentation, where yeast converts sugars into carbon dioxide gas, causing the dough to expand. Using such familiar experiences helps learners understand scientific principles in a tangible way, moving beyond theoretical definitions to recognize science everywhere.

20. (C) Inductive reasoning
Inductive reasoning is a logical process where specific observations or examples are used to form a generalized rule, principle, or theory. It involves identifying patterns in data to make broader generalizations about how nature behaves. While the conclusions reached through induction are probable rather than certain, this method is essential for formulating new hypotheses and theories in various disciplines.

21. (C) I and III
The Indian patent system grants inventors exclusive rights to their inventions for a set period, encouraging innovation by protecting intellectual property. However, the Indian Patent Act explicitly excludes scientific theories and mathematical methods from being patentable, as these are considered discoveries of nature rather than industrial inventions. Patents are reserved for new, non-obvious products or processes with practical applications.

22. (B) Both A and R are true but R is not the correct explanation of A.
The Atal Innovation Mission was established by the Indian government to promote a robust culture of innovation and entrepreneurship. One of its key initiatives is the creation of Atal Tinkering Labs in schools to foster curiosity and scientific thinking among children. While both statements are factual, the existence of tinkering labs is just one specific component and does not fully explain the broad goals.

23. (A) P-II, Q-IV, R-III, S-I
Ancient India contributed significantly to various scientific fields. Aryabhata made monumental advances in mathematics and astronomy. Sushruta is celebrated for detailing complex surgical procedures, while Charaka authored foundational texts on Ayurveda and internal medicine. Kanad is renowned for proposing the early atomic theory in the Vaisheshika school of philosophy. These scholars established a strong rational and empirical tradition.

24. (C) VSSC - Coimbatore
The Vikram Sarabhai Space Centre is a major space research center of the Indian Space Research Organisation. It is located in Thiruvananthapuram, Kerala, not in Coimbatore, Tamil Nadu. Other institutions mentioned, such as the Central Leather Research Institute in Chennai, the Central Electrochemical Research Institute in Karaikudi, and the Indira Gandhi Centre for Atomic Research in Kalpakkam, are correctly located.

25. (B) Invention is the formulation of a new idea; innovation is its practical implementation.
Invention refers to the creation or formulation of a completely new idea, device, or process. Innovation, however, is the practical implementation of such an idea to create value, often involving commercialization or widespread adoption. While an invention marks the initial discovery, innovation represents the journey of bringing that discovery into a useful form that addresses specific societal or economic needs.

Downloaded from www.pdf.tube

26. (A) Ability to transfer knowledge and apply it to novel situations.
A defining feature of conceptual learning is the ability to understand the underlying principles of a subject rather than just memorizing facts. This deep understanding allows learners to transfer their knowledge and apply it effectively to novel or unfamiliar situations. Unlike rote learning, it emphasizes logical connections and the "why" behind phenomena, fostering long-term retention and flexible problem-solving skills.

27. (A) Scientific Policy Resolution, Technology Policy Statement, Science and Technology Policy, Science Technology and Innovation Policy
India's science policy has evolved through four major stages. It began with the Scientific Policy Resolution of 1958, followed by the Technology Policy Statement in 1983. The Science and Technology Policy was then introduced in 2003 to address modern challenges. Finally, the Science, Technology, and Innovation Policy was launched in 2013 to integrate innovation into the national scientific framework.

28. (B) I, III and IV
Ethics in scientific research are vital for maintaining integrity and public trust. Plagiarism and the falsification of data are strictly prohibited, as they undermine the pursuit of truth. Ethical guidelines also ensure the protection of human and animal subjects during trials. Responsible conduct fosters a credible scientific environment where findings can be verified and utilized safely for societal benefit.

29. (A) Both A and R are true and R is the correct explanation of A.
Observation involves gathering data through the senses without interfering with the natural state of the subject, making it a foundational part of inquiry. Experimentation is an active intervention where a researcher deliberately controls and manipulates specific variables to observe their effects. This control allows scientists to establish cause-and-effect relationships, providing a deeper level of insight than observation alone.

30. (A) P-II, Q-I, R-IV, S-III
Science explains common occurrences through specific principles. The cooling in earthen pots results from evaporation. Pressure cookers work by increasing the boiling point of water through high pressure. Rainbows form due to the dispersion and total internal reflection of light in water droplets. Finally, bread dough rises because yeast undergoes anaerobic respiration, releasing carbon dioxide gas that expands the dough.

31. (D) Janaki Ammal - Botany
Janaki Ammal was a pioneering Indian botanist who made significant contributions to genetics and phytogeography. She is particularly noted for her work on sugarcane and the eggplant. While other scientists like Asima Chatterjee and Tessy Thomas also made major impacts, they were in the fields of organic chemistry and missile technology, respectively. Janaki Ammal remains a key historical figure.

32. (C) Predicting human behavior based on celestial positions.
Predicting human behavior or future events based on the positions of celestial bodies, commonly known as astrology, is a classic example of pseudoscience. It lacks empirical evidence, a plausible mechanism, and the testability required by the scientific method. In contrast, geology, spectroscopy, and drug trials are based on rigorous observation, mathematical modeling, and reproducible experiments, making them genuine branches of science.

33. (B) A mindset demanding evidence and logic for claims.
Scientific temper refers to a logical and rational state of mind that demands evidence and reasoning before accepting any claims or beliefs. It is characterized by a spirit of inquiry and a willingness to revise one's opinions in the face of new, verifiable data. This mindset is essential for social progress, as it helps individuals navigate the world by rejecting dogma.

34. (B) III, II, IV, I
Major milestones in Indian science occurred in a specific order. C.V. Raman won the Nobel Prize in 1930. The Council of Scientific and Industrial Research was established in 1942. After independence, the first Scientific Policy Resolution was adopted in 1958. Finally, India entered the space age with the launch of its first satellite, Aryabhata, in 1975, marking a significant achievement.

NODIA

35. (C) I, III and IV
Science plays a transformative role in society by increasing life expectancy through medical breakthroughs and revolutionizing transportation and communication. However, it must operate within ethical boundaries to prevent the misuse of technology. While science impacts socioeconomic policies, it does not create a bias against cultural diversity; rather, it provides a universal framework of knowledge that can benefit all cultures.

36. (C) Non-professionals contribute to data collection.
Citizen science involves non-professional volunteers in the collection and analysis of scientific data. This collaborative approach allows researchers to gather information on a much larger scale than would be possible for a small professional team. It does not replace professional scientists or bypass peer review; instead, it supplements formal research efforts and increases public engagement with various scientific issues.

37. (A) Applying knowledge logically to unfamiliar questions.
For competitive exam aspirants, conceptual learning provides a significant advantage by enabling the logical application of knowledge to unfamiliar or complex questions. Instead of relying on the exact replication of memorized text, students who understand the underlying principles can solve diverse problems by reasoning through them. This approach builds the critical thinking skills necessary for high-level academic and professional success.

38. (D) Integration of multiple scientific fields.
Interdisciplinary science involves the integration of methods, data, and perspectives from multiple scientific fields to solve complex problems or explore new areas of knowledge. This approach recognizes that many real-world phenomena cannot be fully understood within the boundaries of a single traditional discipline. Fields like biochemistry, bioinformatics, and geophysics are examples where different branches of science merge for better insights.

39. (B) 1983
The Technology Policy Statement was issued by the Government of India in 1983. Its primary goal was to achieve technological self-reliance and promote the development of indigenous technologies. The policy aimed to reduce dependence on foreign imports by encouraging local research and development, ensuring that technology was used to address the specific needs of the Indian population and industries.

40. (C) 1971
The Department of Science and Technology was established in May 1971. Its creation was intended to promote new and emerging areas of science and technology in India. As a key government body, the DST plays a crucial role in coordinating scientific activities, providing funding for research, and formulating policies to strengthen the nation's scientific infrastructure and its global competitiveness.

41. (B) II and III
A scientific theory is a well-substantiated explanation of some aspect of the natural world, supported by extensive evidence and widely accepted by the scientific community. Unlike an initial guess or hypothesis, a theory has undergone rigorous testing. Importantly, theories are not static; they can be modified or even discarded if new evidence consistently contradicts their fundamental principles or predictions.

42. (A) Both A and R are true and R is the correct explanation of A.
Superstitions frequently stem from a lack of scientific knowledge and a failure to engage in rational thinking. They operate by incorrectly linking unrelated events through a perceived cause-and-effect relationship that lacks any empirical proof. Because superstitions rely on anecdotes or tradition rather than systematic testing, they fall outside the realm of science, which requires objective evidence to establish true relationships.

43. (A) P-II, Q-I, R-IV, S-III
A standard research paper consists of several key components. The abstract provides a concise summary of the entire study. The methodology section details the specific procedures and tools used. The results section presents the raw data

Click Here to Buy book on Amazon

and statistical analysis findings obtained during the experiment. Finally, the bibliography lists all the references and prior works cited by the researchers in their study.

44. (B) Nanotechnology - The study of the cosmos at a macro scale
Nanotechnology is the study and application of extremely small things, typically at the atomic or molecular level, rather than at a macro scale. It involves manipulating matter at dimensions between 1 and 100 nanometers. In contrast, Bioinformatics manages biological data using computers, Geophysics studies the Earth's physical properties, and Metallurgy investigates the behavior of metallic elements. Each field serves specific purposes.

45. (A) Iterative process using observation and experiment.
The scientific method is an iterative and systematic process that uses observation and experimentation to investigate the natural world. It does not guarantee that every hypothesis will become a law, nor does it require absolute consensus before testing begins. Instead, it relies on measurable data and logical reasoning to refine our understanding, allowing for the continuous correction of scientific ideas.

46. (C) ATL labs restrict students to textbook experiments.
Atal Tinkering Labs are designed to move beyond textbook learning by providing students with hands-on experience and space for innovation. Their purpose is to foster curiosity and creativity through practical experimentation and problem-solving, rather than restricting students to established curriculum tasks. Initiatives like the INSPIRE program and Science Olympiads further support this goal by identifying and nurturing young scientific talent.

47. (B) Invention Conception, Prior Art Search, Patent Application, Patent Grant
The legal protection of a scientific invention follows a specific sequence. It starts with the initial conception of the invention. Next, a prior art search is conducted to ensure the idea is truly new. Once confirmed, a patent application is filed with the relevant authorities. If the application meets all legal and technical requirements, a patent is eventually granted to the inventor.

48. (A) I, II and IV
ISRO was formed in 1969 and has achieved significant milestones, including reaching Mars orbit with Mangalyaan and successfully landing on the lunar south pole with Chandrayaan-3. While it collaborates with various sectors, ISRO functions under the Department of Space, which reports directly to the Prime Minister, rather than being exclusively under the Ministry of Defence. This allows for diverse missions.

49. (A) Both A and R are true and R is the correct explanation of A.
The scientific community holds a deep responsibility for environmental conservation because technological advancements can unintentionally lead to ecological damage if not carefully managed. Scientific research is essential for understanding these impacts and developing sustainable solutions. By considering ecological factors during the implementation of new technologies, scientists can ensure that progress does not come at the expense of long-term health.

NODIA

50. (A) P-IV, Q-I, R-III, S-II
India's scientific growth has been led by visionary individuals. Vikram Sarabhai was the architect of the Indian Space Programme. Homi J. Bhabha pioneered the nation's nuclear science initiatives. Shanti Swarup Bhatnagar was instrumental in establishing the Council of Scientific and Industrial Research. M.S. Swaminathan is celebrated for his leading role in the Green Revolution, which transformed Indian agriculture through scientific innovation.

51. (A) Control Group - Standard for comparisons.
In scientific experiments, the control group serves as a standard for comparison, remaining unaffected by the independent variable. The independent variable is the factor the experimenter intentionally changes, while the dependent variable is the outcome being measured. A hypothesis is a testable prediction rather than a final conclusion. Understanding these terms is fundamental for designing and interpreting rigorous scientific research results.

52. (C) Blindly accepting hypotheses proposed by renowned scientists.
Critical thinking in science involves the objective evaluation of evidence and a willingness to revise beliefs based on new data. It requires individuals to recognize their own biases and analyze the reliability of information. Blindly accepting hypotheses, even those from renowned scientists, contradicts the spirit of critical thinking, which demands that all claims be subjected to rigorous scrutiny and logical verification.

53. (A) Verifying if claims are testable and peer-reviewed.
The most effective way to identify pseudoscience is to check if the claims are testable and have undergone peer review. Genuine scientific theories must be falsifiable and subject to scrutiny by other experts in the field. Reliance on popular appeal, ancient myths, or complex jargon without empirical backing often signals pseudoscientific thinking, which avoids the rigorous validation that defines science.

54. (A) IV, II, I, III
ISRO's major achievements followed a chronological path starting with the first successful PSLV launch in the 1990s. This was followed by the lunar mission Chandrayaan-1 in 2008. The Mars Orbiter Mission, or Mangalyaan, was launched in 2013, making India the first nation to reach Mars on its first attempt. Most recently, Chandrayaan-3 achieved a successful soft landing on the Moon.

55. (A) I, II, III and IV
Modern science is highly interdisciplinary, merging different fields to address complex questions. Bioinformatics combines biology and computer science, while biophysics applies physics to biological systems. Environmental science and mechatronics similarly integrate multiple disciplines. Even classical taxonomy has evolved to incorporate genetic sequencing, showing that no field is truly isolated. This convergence leads to innovative solutions that single-discipline approaches might overlook.

56. (C) Inductive reasoning
When a botanist uses a limited number of specific observations—such as five species of ferns thriving in high humidity—to reach a generalized conclusion about all ferns, she is applying inductive reasoning. This process involves identifying patterns in a small sample and extrapolating them to a larger group. While this provides a useful hypothesis, it requires further testing to be definitively confirmed.

57. (D) Classification-based methodology.
Categorizing living organisms into hierarchical groups like Kingdom, Phylum, and Class based on shared characteristics is a fundamental classification-based methodology in biology. This systematic approach, known as taxonomy, helps scientists organize the vast diversity of life and understand the evolutionary relationships between different species. It is a logical framework used to provide structure and clarity to the study of nature.

58. (A) Theory explains; Law describes.
The primary distinction between a scientific theory and a scientific law is their function. A law provides a descriptive generalization of what happens under certain conditions, often expressed as a mathematical equation. In contrast, a theory provides a comprehensive and well-substantiated explanation of why those phenomena occur. Both are based on empirical evidence but serve different roles in our understanding.

59. (B) Identify talent in theoretical and experimental science.
Science Olympiads are prestigious competitions designed to identify and nurture young talent in both theoretical and experimental science. These events encourage students to go beyond the standard curriculum and develop higher-order thinking and problem-solving skills. By challenging participants with complex scientific problems, the Olympiads help foster a deeper interest in STEM careers and recognize excellence in the next generation.

60. (B) Deductive reasoning
Using a general, established law—such as Newton's Law of Universal Gravitation—to predict the specific trajectory of a particular comet is a classic example of deductive reasoning. This process starts with a broad principle and applies it to a specific case to reach a logical conclusion. If the law and the initial data are accurate, the predicted outcome is considered logically certain.

Downloaded from www.pdf.tube

61. (A) I and II
Science communication aims to make complex research understandable to the general public and is essential for creating informed policies. By demystifying technical jargon, it helps bridge the gap between scientists and society. Effective communication does not seek to make science appear prestigious through jargon; rather, it focuses on clarity and accessibility to promote scientific literacy and engagement across society.

62. (D) A is false but R is true.
Celebrating National Science Day with specific annual themes is not redundant; instead, it is a purposeful way to focus public attention on critical contemporary issues. These themes, such as sustainable development or indigenous technology, help highlight the relevance of science to society's current needs. By setting a theme, the government encourages a more directed and impactful dialogue about science.

63. (A) P-II, Q-III, R-IV, S-I
Various government initiatives target specific scientific and economic goals. Start-up India promotes entrepreneurship, while INSPIRE attracts young talent to science careers. CSIR-NET is a qualifying examination for researchers and lecturers. The Chandrayaan missions focus on lunar exploration and space science. Together, these programs form a comprehensive framework for advancing India's research capabilities, fostering innovation, and supporting the next generation.

64. (C) Science as a product - Established scientific knowledge.
Science can be viewed through several dimensions. As a product, it represents the body of established and verified knowledge we have about the world. As a process, it involves the systematic method of inquiry and questioning. It is also a human activity influenced by social and cultural contexts. Unlike dogmatic beliefs, science thrives on the continuous re-evaluation of theories based on evidence.

65. (B) Eradication of superstitions and blind faith.
Article 51A(h) of the Indian Constitution, which mandates the development of scientific temper and the spirit of inquiry, is most relevant to the eradication of superstitions and blind faith. This fundamental duty encourages citizens to adopt a rational approach to social and personal issues, relying on evidence and logical reasoning rather than unverified beliefs that can hinder national progress.

NODIA

66. (D) Descriptive generalizations based on empirical observations.
Based on the history of scientific discovery, laws are understood as descriptive generalizations of how nature behaves under specific circumstances. They are derived from consistent empirical observations rather than political mandates. While highly reliable, scientific laws are not completely immune to revision; if new data consistently contradicts an established law, it may be refined or replaced to more accurately reflect our understanding.

67. (B) Observation, Hypothesis, Theory, Law
The progression of scientific knowledge typically follows a hierarchical path. It begins with an initial observation of a phenomenon. This leads to the formulation of a testable hypothesis. If the hypothesis is supported by extensive evidence, it may become part of a broader theory. Finally, a law is established when a consistent, descriptive relationship is found to hold true under specific conditions.

68. (A) I, II and III
Jagadish Chandra Bose was a polymath who made groundbreaking discoveries in plant physiology and radio optics. He demonstrated that plants respond to stimuli and invented the crescograph to measure their growth. He was also a pioneer in microwave research. Unlike many modern inventors, he was famously reluctant to patent his work for personal gain, believing that scientific knowledge should be shared freely.

69. (A) Both A and R are true and R is the correct explanation of A.
Science is a human activity deeply embedded in social and cultural contexts. This is because the priorities of scientific research, as well as its funding, are often dictated by the specific needs, values, and challenges of the society in which it occurs. By recognizing this link, we can better understand how scientific progress is both a driver of and a reflection of change.

70. (A) P-IV, Q-I, R-III, S-II
Several Indian and Indian-origin scientists have won Nobel Prizes for their work. C.V. Raman discovered the scattering of light. Har Gobind Khorana interpreted the genetic code. Subrahmanyan Chandrasekhar studied the evolution of massive stars. Venkatraman Ramakrishnan mapped the structure and function of the ribosome. These achievements represent significant contributions to physics, chemistry, and medicine, highlighting the global impact of Indian research.

71. (B) Objectivity - Relying entirely on personal emotions to interpret data
Objectivity in science requires interpreting data based on evidence rather than personal emotions or biases. It is the practice of remaining impartial to ensure that conclusions are accurate and reproducible. Other key scientific attitudes include open-mindedness, which is the willingness to change views with new evidence; skepticism, which involves questioning claims without proof; and curiosity, the desire to investigate the world.

72. (C) Development of high-yielding crop varieties.
Applying scientific principles to agriculture, as seen during the Green Revolution, led to the development of high-yielding crop varieties. These advancements significantly increased food production and helped ensure food security for growing populations. This scientific approach moved farming beyond traditional rituals toward a more evidence-based practice involving genetics, soil science, and efficient resource management, although it also raised new environmental questions.

73. (D) Translating an idea into a value-creating service.
In scientific and economic contexts, innovation is defined as the process of translating an idea or invention into a service or product that creates tangible value. It goes beyond the initial discovery of a phenomenon to include its practical application and widespread adoption. Innovation is essential for economic growth, as it addresses societal needs through the creative and efficient use of knowledge.

74. (A) II, IV, I, III
The development of a defense system by DRDO follows a logical progression. It starts with analyzing requirements and conceptualizing a solution. This is followed by manufacturing a prototype for testing. The system then undergoes rigorous field trials and user testing to ensure it meets operational standards. Finally, if successful, the technology is officially inducted into the armed forces for active service.

75. (A) I, II, III and V
The 1983 Technology Policy Statement aimed to achieve technological competence and self-reliance for India. It emphasized developing indigenous technology while also ensuring the efficient absorption and adaptation of imported technologies. The policy did not completely ban foreign imports; instead, it sought a balanced approach that would strengthen local capabilities while still benefiting from global advancements to meet the country's industrial needs.

76. (B) NITI Aayog
The Atal Innovation Mission is a flagship initiative of NITI Aayog, the premier policy think tank of the Government of India. AIM was established to create and promote a culture of innovation and entrepreneurship across the country. Its programs, such as the Atal Tinkering Labs in schools and various incubation centers, aim to nurture young minds and support startups in developing technologies.

77. (A) CSIR
The Shanti Swarup Bhatnagar Prize is awarded annually by the Council of Scientific and Industrial Research (CSIR). Named after the founding director of CSIR, it is one of India's most prestigious multidisciplinary science awards. The prize recognizes outstanding contributions by young Indian scientists across various fields, including biology, chemistry, physics, and engineering, celebrating excellence and encouraging further research for development.

78. (C) Presenting work without proper attribution.
Plagiarism in scientific research is the unethical practice of presenting someone else's work, ideas, or data as one's own without providing proper attribution or credit. It undermines the integrity of the scientific process, which relies on

Click Here to Buy book on Amazon

transparency and the honest acknowledgement of previous contributions. Maintaining academic honesty is essential for building a reliable body of knowledge and respecting intellectual property rights.

79. (D) Article 51A(h) is a legally enforceable right for science funding.
Article 51A(h) of the Indian Constitution defines the development of scientific temper, humanism, and the spirit of inquiry as a fundamental duty of citizens, rather than a legally enforceable right for funding. While the Constitution encourages scientific progress, these duties serve as guiding principles for individual behavior and national character. They emphasize the role of citizens in fostering a rational society.

80. (C) It must rely strictly on supernatural explanations.
A valid scientific theory must be testable, falsifiable, and consistent with experimental results. It makes predictions that can be verified through further observation. By definition, science excludes supernatural explanations because they cannot be tested or measured using the scientific method. Theories rely on natural mechanisms and empirical evidence, ensuring that scientific knowledge remains grounded in observable and reproducible phenomena rather than faith.

81. (D) I, II and III
Governments play a multifaceted role in science by formulating policies that direct research toward national goals and providing crucial funding for basic science. They also establish regulations to ensure ethical standards are maintained, especially in clinical trials. This support is vital for research that may not have immediate commercial value but is essential for long-term technological advancement and well-being.

82. (A) Both A and R are true and R is the correct explanation of A.
Pseudoscience can be extremely harmful, particularly in health and medicine, because it lacks a verified empirical basis. When individuals rely on unproven pseudoscientific treatments, they may delay or entirely reject proven medical therapies, leading to worsening conditions. By promoting false cause-and-effect relationships, pseudoscience undermines public health and the scientific understanding necessary for making informed decisions about personal well-being.

83. (A) P-IV, Q-II, R-I, S-III
Key terms in scientific reasoning include inference, which is a logical conclusion from evidence, and a paradigm, which provides a widely accepted framework. Falsifiability is the capacity for a hypothesis to be proven wrong, a cornerstone of the scientific method. Finally, empiricism emphasizes that knowledge should be derived strictly from sensory experience and observation. Together, these concepts define how scientists investigate.

84. (C) Tearing from onions - Sulfur compound release.
Science explains common kitchen phenomena through chemical and physical principles. Tearing when cutting onions is caused by the release of sulfur compounds that react with the moisture in the eyes. In contrast, the sour taste of lemons is due to citric acid, and the browning of apples is a chemical reaction with oxygen. Understanding these occurrences helps connect concepts to life.

85. (A) Asking a specific, testable question.
The most fundamental prerequisite for any scientific investigation is asking a specific, testable question. This initial step defines the scope of the inquiry and provides a clear focus for observation and experimentation. Without a well-defined question, it is impossible to formulate a hypothesis or design an experiment that can produce meaningful data. It is the spark that initiates the process.

86. (D) Biotechnology in agriculture
Using modern genetic sequencing tools to identify drought-resistant rice genes is a direct and practical application of biotechnology in agriculture. This scientific approach allows researchers to understand and manipulate the genetic makeup of crops to improve their resilience and yield. It represents the integration of advanced molecular biology with traditional farming needs, leading to more sustainable and productive agricultural practices for future.

Downloaded from www.pdf.tube

87. (B) Ideation, Prototype Development, Seed Funding, Market Expansion
The lifecycle of a technology start-up typically begins with ideation, where the core concept is developed. This is followed by creating a prototype to demonstrate the product's feasibility. Once a working model exists, the start-up often seeks seed funding to support initial operations. Finally, if the product is successful in the market, the company moves into the market expansion phase to grow.

88. (A) I and II
Modern scientific research increasingly recognizes that complex problems like climate change cannot be solved by a single discipline alone. The convergence of different fields leads to the emergence of new, integrated areas like biochemistry, which provide more comprehensive insights. Rather than separating disciplines, modern innovation thrives on collaboration across biology, physics, and chemistry to address the multifaceted challenges facing the world.

89. (A) Both A and R are true and R is the correct explanation of A.
Conceptual learning is superior to rote learning because it focuses on understanding the underlying "why" and "how" of phenomena. This deep comprehension allows students to connect different ideas and apply their knowledge more effectively to novel situations. By building a logical framework, conceptual learning fosters the critical thinking skills and long-term retention necessary for success in advanced scientific study.

90. (A) P-II, Q-I, R-IV, S-III
Pseudosciences often make extraordinary claims without empirical backing. Phrenology attempted to link skull shape to personality, while alchemy sought to transmute base metals into gold. Astrology predicts human events based on star positions, and homeopathy uses highly diluted substances to treat symptoms. These practices lack the testability and reproducible evidence required by genuine science, often relying on tradition or anecdotal testimony.

91. (B) CSIR - Ministry of Health
The Council of Scientific and Industrial Research (CSIR) does not fall under the Ministry of Health; it is an autonomous body that reports to the Ministry of Science and Technology. Other organizations like ISRO, DRDO, and DBT are correctly matched with their respective ministries. This ministerial oversight helps coordinate research efforts with national priorities and ensure that science serves development.

92. (B) Empirical observation and experiment.
The primary and only valid sources of scientific knowledge are empirical observation and systematic experimentation. These methods ensure that information is gathered objectively and can be tested and verified by others. Unlike anecdotal accounts, myths, or dogmatic beliefs, scientific knowledge is built on a foundation of reproducible data, allowing for the continuous refinement and improvement of our understanding of nature.

93. (A) Hypothesis is tentative; Theory is substantiated.
In science, a hypothesis is a tentative and testable explanation for an observation that has yet to be fully supported. A theory, however, is a comprehensive and well-substantiated explanation that is backed by a vast body of evidence and extensive testing. While a hypothesis serves as a starting point for inquiry, a theory represents a much higher level of scientific validation.

94. (A) II, III, I, IV
Establishing a scientific law begins with the initial observation of a natural phenomenon. This leads to the formulation of a hypothesis to explain the observation. The hypothesis then undergoes repeated independent testing to ensure the results are consistent. If the relationship is found to be universally true under specific conditions, it is eventually established as a law, providing a descriptive generalization.

95. (A) I, II, III and V
India's science education faces challenges like infrastructure gaps in rural areas, leading to reforms under NEP 2020 that emphasize competency-based and experiential learning. These measures aim to reduce rote memorization and encourage students to participate in programs like Science Olympiads. Additionally, integrating regional languages into science teaching is viewed

NODIA

as a way to improve conceptual understanding among students from diverse backgrounds.

96. (C) Leading missions as Project Directors.
A prominent feature of women breaking stereotypes in Indian science is their role in leading major missions as Project Directors, such as in the Chandrayaan program. This shift demonstrates a movement toward an inclusive environment where talent and leadership are recognized regardless of gender. Their contributions span theoretical research, engineering, and high-level management in top institutions, inspiring future generations of scientists.

97. (B) Birdwatching apps for tracking patterns.
Birdwatching apps are classic examples of citizen science tools, as they allow members of the general public to contribute observations of bird patterns to a global database. This large-scale data collection helps professional researchers track migration and biodiversity in ways impossible for small teams. Such tools democratize scientific research and encourage public engagement with environmental monitoring and critical conservation efforts.

98. (D) Maintain credibility and protect subjects.
Research integrity and ethics are essential for maintaining the credibility of scientific findings and protecting the subjects involved in experiments. By ensuring that data is reported honestly and that trials are conducted safely, ethics build public trust in science. This framework prevents misconduct like falsification or plagiarism, ensuring that scientific progress remains a reliable and socially responsible pursuit of truth.

99. (A) Communication and public understanding are urgent.
The prevalence of vaccine hesitancy driven by social media misinformation highlights an urgent need for effective science communication and public understanding. When scientific facts are misunderstood or misrepresented, it can lead to serious public health risks. Improving how science is communicated helps the public distinguish between verified medical information and baseless claims, ensuring that individuals can make informed decisions based on evidence.

100. (C) Higher-order thinking and problem-solving.
Participating in Science Olympiads offers students the advantage of developing higher-order thinking and complex problem-solving skills. These competitions present challenges that go beyond the standard school curriculum, requiring participants to apply scientific principles in creative and logical ways. This intellectual rigor prepares students for advanced academic study and helps identify the next generation of scientific leaders who can tackle global challenges.

101. (C) I and III
Critical thinking is characterized by the objective evaluation of evidence and arguments, as well as the ability to identify logical fallacies. It involves moving beyond emotional responses to form conclusions based on reason and data. By applying these skills, individuals can better navigate complex information and avoid being misled by biased or flawed reasoning, which is essential for informed citizenship.

102. (A) Both A and R are true and R is the correct explanation of A.
Ancient Indian contributions like zero and the decimal system are foundational to modern mathematics. These concepts were transmitted to the Western world via Arab scholars, who integrated them into the global knowledge pool during the Middle Ages. This historical exchange highlights how scientific and mathematical ideas from India became the bedrock of global progress, demonstrating the long-standing tradition of rational thought.

103. (A) P-IV, Q-II, R-I, S-III
Many world-renowned scientists have strong roots in Tamil Nadu. C.V. Raman made breakthroughs in light scattering. Srinivasa Ramanujan contributed immensely to number theory. Dr. V. Shanta was a pioneer in oncology and cancer care. Dr. M.S. Swaminathan led the Green Revolution in agriculture. Their diverse achievements in physics, mathematics, medicine, and genetics have had a profound impact on national development and global science.

104. (C) Fabrication - Reporting made-up data.
Research misconduct involves several serious ethical violations. Fabrication refers to the act

Click Here to Buy book on Amazon

of reporting entirely made-up data or results. In contrast, falsification involves manipulating research materials or processes to change the outcome. Plagiarism is the use of someone else's work without credit. Each of these practices undermines the integrity of scientific research and can lead to the withdrawal of findings.

105. (D) Falsifiability and empirical testing.
Pseudoscience is strictly defined by its lack of falsifiability and its failure to adhere to empirical testing. Genuine scientific claims must be structured in a way that they can be proven wrong through observation or experiment. Pseudoscientific theories often rely on vague or untestable assertions that cannot be challenged, distinguishing them from authentic science, which welcomes scrutiny and updates based on data.

106. (A) Sir C.V. Raman
Sir C.V. Raman was the first Indian and Asian scientist to win the Nobel Prize in Physics, which he received in 1930. He was awarded for his groundbreaking work on the scattering of light and the discovery of the Raman Effect. This achievement marked a significant milestone in India's scientific history and continues to inspire generations of researchers to pursue fundamental physics.

107. (A) SLV-3, ASLV, PSLV, GSLV
ISRO developed its launch vehicles in a chronological sequence to increase payload capacity and reach different orbits. It began with the Satellite Launch Vehicle-3, followed by the Augmented Satellite Launch Vehicle. Next came the Polar Satellite Launch Vehicle, which became the workhorse for many missions. Finally, the Geosynchronous Satellite Launch Vehicle was developed for heavier satellites, representing increasing technological sophistication.

108. (A) I, II and IV
Science communication is vital for demystifying technical jargon, promoting scientific temper, and helping citizens make informed decisions about health and the environment. While journalists play a role, scientists also share the responsibility of communicating their findings clearly to the public. By fostering a more scientifically literate society, effective communication helps combat misinformation and ensures that scientific progress benefits everyone in a meaningful way.

109. (A) Both A and R are true and R is the correct explanation of A.
Science and technology are mutually dependent. Scientific discoveries often provide the theoretical basis for new technological inventions, such as how understanding electromagnetic waves led to wireless communication. Conversely, advanced technology enables deeper scientific research, like how sophisticated telescopes allow for new astronomical discoveries. This synergistic relationship drives the rapid pace of modern progress, as each field constantly provides tools and knowledge.

NODIA

110. (A) P-III, Q-I, R-IV, S-II
India has undergone several scientific "revolutions" to achieve self-sufficiency. The Green Revolution focused on wheat and rice production. The White Revolution transformed dairy and milk production. The Blue Revolution aimed at increasing fish and aquaculture yields. Finally, the Yellow Revolution targeted oilseeds. Each of these initiatives utilized scientific research and technological applications to address food security and improve the livelihoods of millions.

111. (D) Superstition - To conduct rigorous empirical experiments
Superstitions do not aim to conduct rigorous empirical experiments; instead, they rely on unverified beliefs, traditions, or anecdotal evidence. In contrast, science seeks to understand natural phenomena, technology applies that knowledge for practical use, and engineering focuses on designing and building systems. By definition, superstitious thinking is the opposite of the systematic, evidence-based approach that characterizes the scientific method and related professional disciplines.

112. (C) Raman Effect discovery announced.
National Science Day is celebrated on February 28 to commemorate the day in 1928 when Sir C.V. Raman announced the discovery of the Raman Effect. This discovery, which describes how light changes wavelength when scattered by molecules, was a monumental achievement in physics. The day serves to highlight the

importance of scientific research and its contributions, encouraging a spirit of inquiry throughout India.

113. (B) The term of every patent granted is 20 years from the date of filing.
Under the Indian Patents Act, the term of every patent granted is 20 years from the date of filing. This period of protection provides inventors with exclusive rights to their invention, allowing them to benefit commercially from their innovation. Once this term expires, the invention enters the public domain, where it can be freely used by others, balancing incentive with public interest.

114. (A) II, III, I
Deductive reasoning follows a logical path starting with a general premise or theory. A secondary or minor premise is then identified to connect the general principle to a specific case. Finally, a logical conclusion is formulated. If both premises are true and the reasoning is valid, the conclusion is guaranteed to be certain, making this a powerful tool for testing existing laws.

115. (A) I, II, IV and V
The scientific community's environmental responsibilities include developing sustainable green technologies, assessing ecological impacts, and innovating in renewable energy. Scientists also play a key role in advising policymakers on climate change mitigation. Promoting fossil fuel dependency would contradict these goals, as science increasingly focuses on reducing environmental damage and finding long-term solutions to preserve the planet's resources and biodiversity for future.

116. (C) Foundational ability to critique and analyze.
Rote learning does not build a foundational ability to critique and analyze; in fact, it often hinders these skills by focusing only on memorization. While it may be useful for learning basic facts like multiplication tables or alphabets, it fails to promote the deep understanding needed for critical thinking. Genuine scientific education must go beyond rote methods to foster analytical skills.

117. (A) Pure theoretical topology
Pure theoretical topology is a branch of mathematics and is generally considered a single-discipline field rather than an interdisciplinary science. In contrast, fields like biochemistry, astrobiology, and geophysics explicitly merge multiple scientific disciplines, such as biology, chemistry, and physics, to study complex phenomena. Interdisciplinary sciences are increasingly important for addressing modern challenges that transcend the boundaries of any one traditional area of research.

118. (D) Promote innovation and entrepreneurship ecosystem.
The primary goal of the Atal Innovation Mission is to promote a culture of innovation and entrepreneurship across India. By establishing tinkering labs in schools and incubation centers for start-ups, AIM provides the necessary infrastructure and support for new ideas to thrive. Its mission is to build a robust ecosystem that encourages creative problem-solving and technological development, contributing to national economic growth.

119. (B) Establishing Scientific Temper in society
Promoting public debates, fact-checking health claims, and encouraging skepticism are all practical applications of fostering scientific temper in society. These activities empower individuals to use evidence and logic to evaluate the information they encounter, particularly in the age of digital misinformation. By developing a rational and questioning mindset, citizens can better distinguish between scientific facts and baseless superstitions, leading to informed decision-making.

120. (C) Aeronautics, Armaments, Electronics, and Missiles.
The Defence Research and Development Organisation (DRDO) focuses its research on technologies critical to national security. Its work is classified into areas such as aeronautics, armaments, electronics, missiles, and naval systems. By developing indigenous defense technologies, DRDO strengthens India's military capabilities and reduces dependence on foreign imports, playing a vital role in strategic self-reliance and technological advancement in the defense sector.

Downloaded from www.pdf.tube

121. (A) I and II
Science and culture are deeply interconnected and constantly influence each other. Science can shape culture by introducing new perspectives and challenging traditional dogmas, while cultural values often dictate the ethical boundaries and priorities of scientific research. Recognizing this dynamic relationship is essential for understanding how scientific progress is integrated into society and how societal needs can drive innovation in various fields.

122. (A) Both A and R are true and R is the correct explanation of A.
A core characteristic of scientific knowledge is its testability. This means that for a claim to be considered scientific, it must be capable of being verified or refuted through observation and experimentation. If an assertion cannot be tested using these empirical methods, it lies outside the realm of science. This requirement ensures that scientific knowledge is based on objective evidence rather than personal belief.

123. (A) P-III, Q-II, R-I
Tamil Nadu hosts several key CSIR laboratories, each with a specific focus. The Central Leather Research Institute in Chennai handles leather research, while the Central Electrochemical Research Institute in Karaikudi focuses on electrochemical science. The Structural Engineering Research Centre, also in Chennai, specializes in structural engineering. Together, these institutions contribute to industrial development and scientific advancement in the region and throughout India.

124. (B) Eclipses emit poisonous rays - The moon simply blocks sunlight causing temporary darkness
Many superstitions can be addressed through rational scientific explanations. For instance, the fear that eclipses emit poisonous rays is baseless; an eclipse is simply the temporary blocking of sunlight by the moon. Understanding the celestial mechanics behind such events helps dispel myths and encourages a more scientific worldview. Other superstitions, like bad luck from broken mirrors, similarly lack any empirical or logical support.

125. (A) Induction moves from specific to general.
Inductive reasoning moves from specific observations to general principles, helping to formulate new hypotheses. In contrast, deductive reasoning starts with a general rule and applies it to specific cases to reach a logical conclusion. While induction provides probable results, deduction offers certainty if the premises are true. Both are essential components of the scientific method, allowing researchers to generate and test ideas.

126. (C) Substantiated explanation tested and acquired.
A prominent feature of a scientific theory is that it is a well-substantiated explanation acquired through extensive testing and supported by a vast body of evidence. It is not a mere guess or a rigid truth immune to change. Instead, it provides a flexible framework that can be modified if new evidence emerges, ensuring that scientific understanding remains accurate and consistent with current data.

127. (A) Formulate Hypothesis, Collect Data, Analyze Data, Draw Conclusion
Testing a hypothesis follows a logical sequence. It starts with formulating a testable explanation for an observation. Next, data is collected through systematic experiments or observations. This data is then analyzed to see if it supports or refutes the initial idea. Finally, a conclusion is drawn based on the analysis. This process ensures that scientific conclusions are based on evidence rather than intuition.

NODIA

128. (A) I, II and IV
Women in India have made significant strides in science, serving as Project Directors for lunar missions and being elected as Fellows of the Royal Society. Programs like 'KIRAN' actively support women in research. Contrary to the idea of decreasing participation, the involvement of women in STEM has been growing, reflecting a broader social shift toward gender equality and recognition of scientific talent.

129. (A) Both A and R are true and R is the correct explanation of A.
Modern scientific research increasingly requires an interdisciplinary approach because complex global challenges, such as pandemics and climate

change, cannot be fully understood through a single lens. These problems involve biological, chemical, physical, and social factors that require experts from different fields to collaborate. By integrating diverse perspectives, researchers can develop more effective and comprehensive solutions to multifaceted global issues.

130. (A) P-III, Q-IV, R-I, S-II
Ancient Indian scientific texts cover a range of disciplines. The Surya Siddhanta deals with astronomy, while the Charaka Samhita is a foundational text for Ayurveda and medicine. The Sulba Sutras provide early insights into geometry and mathematics, and the Vaisheshika Sutra contains early concepts regarding atoms. These texts demonstrate that rational and systematic inquiry has a long history in the Indian tradition.

131. (D) STIP Policy - 1990.
The Science, Technology, and Innovation Policy was launched in 2013, not 1990. Other major policy milestones are correctly matched: the Scientific Policy Resolution in 1958, the Technology Policy Statement in 1983, and the Science and Technology Policy in 2003. This evolution reflects India's ongoing commitment to adapting its scientific framework to meet changing national needs and the demands of a globalized economy.

132. (C) Low-cost generic drugs and vaccines.
The production of low-cost generic drugs and vaccines is a prime example of modern Indian innovation that bridges science and entrepreneurship. By applying scientific research to industrial processes, India has become a global leader in providing affordable healthcare solutions. This achievement demonstrates how scientific knowledge can be used to create economic value and address critical social needs, both nationally and around the world.

133. (A) Intellectual curiosity and inquiry spirit.
The most fundamental factor driving a scientist is intellectual curiosity and a spirit of inquiry. This mindset encourages researchers to continuously question existing paradigms and seek new knowledge through observation and experimentation. Unlike dogmatic thinking, which resists change, scientific inquiry thrives on the pursuit of truth and a willingness to revise one's understanding in the face of new, verifiable evidence about nature.

134. (A) III, I, II, IV
The process of inductive reasoning starts with making specific observations. From these, a researcher detects a pattern or regularity in the data. This leads to the formulation of a tentative hypothesis to explain the pattern. Finally, if the findings are consistent, a more general theory or conclusion is developed. This method is essential for exploring new phenomena and generating fresh scientific perspectives.

135. (A) I, II, IV and V
The Startup India initiative aims to build a strong ecosystem for innovation and supports startups through funding, tax exemptions, and a patent facilitation scheme. It is not limited to IT but includes various sectors like biotechnology and hardware. By encouraging entrepreneurship, the program seeks to drive economic growth and job creation, helping to transform India into a hub for new technologies.

136. (C) An observation
Systematically recording environmental data, such as temperature and humidity, over a long period without intervening in the process is defined as an observation. Unlike an experiment, which involves the manipulation of variables to test a cause-and-effect relationship, observation focuses on gathering information as it occurs naturally. This process is a fundamental part of the scientific method, providing the raw data for formulating hypotheses.

137. (D) Policies based on empirical data analysis.
Incorporating scientific principles into national policy making ensures that decisions are based on the rigorous analysis of empirical data. This approach helps policymakers identify the most effective solutions to social and economic problems, moving beyond intuition. By using evidence-based reasoning, governments can create more reliable and impactful policies that address real-world needs and lead to more sustainable and effective national development.

138. (A) Tentative, testable phenomenon explanation.
A hypothesis is a tentative and testable explanation for a natural phenomenon or an

Click Here to Buy book on Amazon

observation. It serves as a starting point for further scientific investigation and must be structured so that it can be either supported or refuted through experimentation. Unlike a law or a theory, which represents more established knowledge, a hypothesis is an initial proposition that guides the research process.

139. (B) NITI Aayog
NITI Aayog is the premier public policy think tank of the Government of India and oversees the Atal Innovation Mission. By coordinating this mission, NITI Aayog helps direct national efforts toward fostering innovation and entrepreneurship at all levels. Its leadership ensures that AIM's initiatives are aligned with broader national goals for economic development and technological progress in a rapidly changing global landscape.

140. (B) Innovation in Science Pursuit for Inspired Research.
The INSPIRE scheme stands for "Innovation in Science Pursuit for Inspired Research." It is a major program by the Department of Science and Technology designed to attract talented young people to the study of science and careers in research. By providing scholarships and awards, the scheme encourages students to pursue scientific education from an early age, helping build India's future research capabilities.

141. (D) I, II and III
While science is a powerful tool for understanding the natural world, it has certain limitations. It cannot make moral or aesthetic judgments, nor can it provide absolute proof, only high degrees of probability based on evidence. Furthermore, science is not equipped to answer philosophical questions about the ultimate meaning of life. Recognizing these boundaries helps maintain the integrity of scientific inquiry and discourse.

142. (A) Both A and R are true and R is the correct explanation of A.
Developing a scientific temper naturally leads to conflict with superstitions because the two approaches are fundamentally different. Scientific temper relies on questioning and the requirement of empirical evidence, whereas superstitions demand blind faith without proof. By encouraging a rational mindset, scientific temper helps individuals move away from baseless beliefs and adopt a more objective and evidence-based understanding of the world.

143. (A) P-IV, Q-II, R-I, S-III
Common kitchen substances have specific chemical identities. Baking soda is sodium bicarbonate, and vinegar contains acetic acid. Table salt is sodium chloride, while lemon juice is rich in citric acid. Understanding the chemical nature of these everyday items helps students connect scientific concepts to their immediate environment, demonstrating how chemistry is at work in familiar settings like food preparation and tasks.

144. (C) Param 8000 - India's first supercomputer
India has achieved several major milestones in engineering and technology. Param 8000 was the nation's first supercomputer, developed indigenous in the early 1990s. Other projects like the Tejas aircraft and the INS Arihant submarine also represent significant technological advancements. These achievements highlight India's growing capability to design and build complex, high-tech systems independently, contributing to both its economy and national security.

145. (B) Isolate variables and establish causes.
Experimentation is critical in science because it allows researchers to isolate specific variables and establish clear cause-and-effect relationships. By carefully controlling the conditions of a study, scientists can determine which factors influence an outcome. This process moves scientific inquiry beyond simple observation, providing the rigorous data needed to test hypotheses and build a reliable understanding of the natural world and its mechanisms.

146. (D) It welcomes peer review and testing.
Pseudoscience does not welcome peer review or rigorous testing; instead, it often avoids or resists scrutiny from the scientific community. Characteristics of pseudoscience include a heavy reliance on anecdotal evidence, the use of scientific-sounding jargon without substance, and the avoidance of precise, falsifiable predictions. By rejecting the self-correcting mechanisms of genuine science, pseudoscientific practices

NODIA

maintain their claims even when contradicted by data.

147. (A) Normal Science, Anomalies, Crisis, Paradigm Shift
The progress of a scientific paradigm follows a specific sequence. It starts with a period of normal science, where research occurs within an established framework. Over time, anomalies emerge that the current model cannot explain. As these anomalies accumulate, a crisis occurs, leading to a period of instability. Eventually, this results in a paradigm shift, where a new framework replaces the old one.

148. (A) I, II and IV
Citizen science offers numerous benefits, such as enabling large-scale data collection and democratizing the scientific process by involving the public. It also helps raise environmental awareness and scientific literacy among participants. While the data collected is valuable, it is not guaranteed to be error-free; however, researchers use various methods to ensure quality. Overall, citizen science strengthens the connection between science and society.

149. (A) Both A and R are true and R is the correct explanation of A.
The ethical debate surrounding Artificial Intelligence is crucial because unregulated algorithms can lead to serious social issues. These include the perpetuation of biases, the compromise of personal data privacy, and a lack of transparency in how decisions are made. By establishing responsible guidelines and regulations, society can ensure that AI technology is developed and used in a way that is fair and safe.

150. (A) P-II, Q-I, R-IV, S-III
Indian scientists have made foundational discoveries across several fields. Satyendra Nath Bose developed Bose-Einstein statistics. Meghnad Saha formulated the thermal ionization equation. G.N. Ramachandran created the Ramachandran plot for protein structures, and Yellapragada Subbarow was instrumental in the synthesis of ATP and important antibiotics. These contributions have had a lasting impact on physics and medicine, highlighting the global importance of Indian research.

NODIA

151. (B) Bootstrapping - Relying on heavy subsidies.
Bootstrapping is the process of starting and growing a business using only personal savings and initial revenue, rather than relying on external funding or heavy subsidies. In contrast, incubators help early-stage start-ups develop their products, angel investors provide initial capital, and unicorns are privately held companies valued at over $1 billion. Understanding these terms is essential for navigating the modern ecosystem of innovation.

152. (C) Appealing to traditional authority for validation
Appealing to traditional authority for validation is not a core step in the scientific method; in fact, it contradicts the spirit of science, which relies on evidence and logic. The scientific method involves asking questions based on observation, formulating testable hypotheses, and conducting experiments to gather data. Genuine scientific knowledge is built through systematic inquiry and the objective testing of ideas.

153. (D) Integrate conceptual learning in schools.
The most effective strategy for a government to eradicate superstitions is to integrate conceptual learning into the school system. By focusing on the "why" and "how" of natural phenomena, educators can help students develop the critical thinking skills and rational mindset needed to evaluate claims based on evidence. This approach addresses the root cause of superstitions, leading to a more informed society.

154. (A) I, II, III, IV
Conducting a controlled experiment follows a logical order. It begins with defining the independent and dependent variables. Next, a control group and an experimental group are set up to allow for comparison. The researcher then records the data observed during the process. Finally, the data is analyzed to determine if it supports the initial hypothesis, ensuring that the results are objectively investigated.

155. (A) I, II, IV and V
Scientific discoveries have revolutionized human life through breakthroughs like antibiotics, transistors, and the mapping of the human genome. Advances in thermodynamics also drove the Industrial Revolution. However,

while science has significantly improved food production, global hunger has not been completely eliminated, showing that scientific progress must be combined with effective social and economic policies to address complex global challenges like food security.

156. (B) Demand empirical data and verification.
When confronted with an extraordinary claim that contradicts established scientific laws—such as a machine that defies thermodynamics—the correct application of reasoning is to demand empirical data and independent verification. A person with scientific temper does not accept such claims on faith. Instead, they require rigorous testing and proof to determine if the new claim is valid or based on faulty logic and evidence.

157. (A) Intellectual Property Rights (IPR)
Patents, copyrights, and trademarks are all classified as Intellectual Property Rights. These legal protections grant creators and inventors exclusive rights to their work for a specific period, encouraging innovation and creative expression by allowing them to benefit from their efforts. IPR is a critical component of the modern knowledge economy, as it provides the incentive for individuals to invest in development.

158. (C) Science embraces falsifiability and criticism.
The crucial differentiator between science and pseudoscience is that science embraces falsifiability and criticism. Genuine scientific theories are structured so they can be proven wrong and are constantly updated as new evidence emerges. In contrast, pseudoscience often relies on untestable claims and resists revision when confronted with contradictory data. This openness to scrutiny is what allows science to progressively improve understanding.

159. (D) Accurate, engaging, and accessible formats.
Good science communication is characterized by being accurate, engaging, and accessible to its intended audience. Its goal is to bridge the gap between complex research and public understanding without using excessive jargon. By being transparent about methodology and limitations, effective communication builds trust and helps the public make more informed decisions about scientific and technological issues that affect daily lives.

160. (C) Applying experiential learning for scientific laws.
An educator dropping objects to demonstrate gravity is a classic example of experiential learning. By allowing students to observe a scientific principle in action, the teacher helps them move beyond the rote memorization of laws to a more conceptual understanding. This hands-on approach makes abstract ideas more tangible and encourages students to engage with science through direct observation, fostering lasting scientific temper.

www.nodia.in

Downloaded from www.pdf.tube

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

CHAPTER 02

Science as a Tool Understanding the Universe

1. Which of the following best defines the Big Bang theory regarding the origin of the universe?
(A) Expansion from an extremely hot, dense singularity 13.8 billion years ago
(B) Constant existence in a steady state without a discernible beginning or end
(C) Infinite cycles involving an alternating expansion and contraction process
(D) Creation as a static, unchanging entity with galaxies held at fixed distances
(E) Answer not known

2. Consider the following statements regarding the evidence for the Big Bang theory:
I. The discovery of the Cosmic Microwave Background (CMB) radiation.
II. The observed blue shift in the light from distant galaxies.
III. The relative abundance of light elements like hydrogen and helium in the universe.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II only
(D) III only
(E) Answer not known

3. Match the types of galaxies in List I with their defining characteristics in List II:
List I: (Galaxy Type)
P. Spiral Galaxy
Q. Elliptical Galaxy
R. Irregular Galaxy
S. Barred Spiral Galaxy
List II: (Characteristic)
I. Lacks a distinct regular shape, often rich in gas and dust
II. Has a central bar-shaped structure composed of stars
III. Consists mostly of older stars with very little interstellar matter
IV. Features a flat, rotating disk with spiral arms
(A) P-IV, Q-III, R-I, S-II
(B) P-III, Q-I, R-IV, S-II
(C) P-II, Q-IV, R-III, S-I
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

NODIA

4. What is the currently accepted scientific estimate for the age of the universe?
(A) 4.5 billion years
(B) 10.2 billion years
(C) 25.4 billion years
(D) 13.8 billion years
(E) Answer not known

5. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The light from distant galaxies is shifted towards the red end of the spectrum.
Reason (R): The universe is expanding, causing the electromagnetic waves to stretch as galaxies move away from the observer.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

6. Which of the following pairs regarding the structure of the Milky Way is incorrectly matched?
(A) Galactic Centre - Contains a supermassive black hole called Sagittarius A*
(B) Orion Arm - The spiral arm where our solar system is located
(C) Galactic Halo - A flat disk containing

predominantly young, hot stars
(D) Milky Way Type - Barred spiral galaxy
(E) Answer not known

7. Identify the correct sequence of cosmic evolution from the earliest to the most recent:
(A) Formation of neutral atoms, Cosmic inflation, Formation of stars, Formation of galaxies
(B) Cosmic inflation, Formation of neutral atoms, Formation of stars, Formation of galaxies
(C) Formation of galaxies, Formation of stars, Cosmic inflation, Formation of neutral atoms
(D) Cosmic inflation, Formation of stars, Formation of neutral atoms, Formation of galaxies
(E) Answer not known

8. The Hubble constant describes which of the following cosmological phenomena?
(A) The rate at which the universe is currently expanding
(B) The rate of radioactive decay of Carbon-14 in space
(C) The speed of light traveling through a vacuum
(D) The predictable orbit of comets in the solar system
(E) Answer not known

9. Consider the following statements about the Milky Way galaxy:
I. It is an elliptical galaxy containing around 100 to 400 billion stars.
II. Our solar system is located roughly 27,000 light-years from the galactic centre.
III. It belongs to a group of galaxies known as the Local Group.
IV. It is currently on a collision course with the Andromeda galaxy.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) I and IV
(C) II, III and IV
(D) I and III
(E) Answer not known

10. Match the Space Telescopes in List I with their primary operational wavelengths in List II:
List I: (Space Telescope)
P. Hubble Space Telescope
Q. James Webb Space Telescope
R. Chandra Observatory
S. Spitzer Space Telescope
List II: (Primary Wavelength)
I. X-ray
II. Infrared
III. Optical / Ultraviolet
IV. Mid to Far Infrared
(A) P-III, Q-II, R-I, S-IV
(B) P-II, Q-IV, R-III, S-I
(C) P-IV, Q-III, R-II, S-I
(D) P-I, Q-II, R-IV, S-III
(E) Answer not known

11. Which of the following statements about Hubble's observation is correct?
(A) The recessional velocity of a galaxy is directly proportional to its distance from Earth
(B) The recessional velocity of a galaxy is inversely proportional to its distance from Earth
(C) All galaxies are moving towards the Milky Way at a constant speed
(D) The size of a galaxy determines the rate at which it expands
(E) Answer not known

12. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The rotational speeds of stars in the outer regions of the Milky Way are much higher than expected based on visible matter.
Reason (R): The Milky Way is embedded in a massive halo of dark matter that exerts additional gravitational pull.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

13. Which of the following statements regarding the size of the universe is incorrect?
(A) The observable universe is approximately 93

Click Here to Buy book on Amazon

billion light-years in diameter
(B) The universe has expanded at speeds faster than the speed of light during inflation
(C) We cannot observe beyond the cosmic light horizon due to the finite speed of light
(D) The entire universe is physically bounded by a rigid outer edge
(E) Answer not known

14. Arrange the following celestial structures in increasing order of their size:
1. Solar System
2. Local Group
3. Milky Way Galaxy
4. Laniakea Supercluster

(A) 1, 3, 2, 4
(B) 1, 2, 3, 4
(C) 3, 1, 4, 2
(D) 4, 2, 3, 1
(E) Answer not known

15. Which of the following pairs of galaxies and their classifications is correctly matched?
(A) Andromeda - Irregular galaxy
(B) Magellanic Clouds - Dwarf irregular galaxies
(C) Milky Way - Elliptical galaxy
(D) Sombrero - Barred spiral galaxy
(E) Answer not known

16. Consider the following statements regarding theories of the universe:
I. The Big Bang theory suggests a sudden expansion from a singularity.
II. The Steady State theory proposes continuous matter creation to keep density constant.
III. The Pulsating theory suggests alternating cycles of expansion and contraction.
IV. The Big Bang theory is supported by the cosmic microwave background radiation.
V. The Steady State theory is currently the most widely accepted scientific model.

Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) I, II and IV
(E) Answer not known

17. Which of the following is NOT a recognized morphological classification of galaxies under the Hubble sequence?
(A) Hexagonal
(B) Spiral
(C) Elliptical
(D) Lenticular
(E) Answer not known

18. Which of the following best describes the phenomenon of "red shift" in astronomy?
(A) A thermal increase in a dying star as it transitions into its red phase
(B) The absorption of blue light by dust, resulting in a shift to red hues
(C) Stretching of light wavelengths due to a source moving away from the observer
(D) A polarity shift in a star that triggers high-intensity red solar flares
(E) Answer not known

19. If an astronomer observes that the spectral lines from a distant star are shifted towards the blue end of the electromagnetic spectrum, what can be applied using the Doppler effect?
(A) The star is moving towards the observer
(B) The star is rapidly expanding into a red giant
(C) The star is moving away from the observer
(D) The star is experiencing a supernova explosion
(E) Answer not known

20. Based on its structure, the Milky Way is classified as which type of galaxy?
(A) Elliptical galaxy
(B) Irregular galaxy
(C) Lenticular galaxy
(D) Barred spiral galaxy
(E) Answer not known

21. Which of the following correctly highlights a primary comparison between stars and planets?
(A) Stars reflect external light whereas planets primarily undergo nuclear fusion
(B) Stars generate their own light via fusion, while planets reflect stellar light
(C) Both entities generate primary energy through continuous radioactive core decay
(D) Planets possess significantly more mass than the specific stars they orbit
(E) Answer not known

22. Consider the following statements about star formation:

NODIA

I. Stars are born in vast clouds of gas and dust called nebulae.
II. As a protostar collapses under gravity, its core temperature decreases.
III. A star enters the main sequence phase when nuclear fusion of hydrogen begins.

Which of the above statement(s) is/are incorrect?
(A) I and III
(B) I only
(C) II and III
(D) II only
(E) Answer not known

23. Match the stellar characteristics on the Hertzsprung-Russell (H-R) diagram in List I with their descriptions in List II:

List I: (Stellar Category)
P. Main Sequence
Q. Red Giants
R. White Dwarfs
S. Supergiants

List II: (Characteristics)
I. High luminosity, low surface temperature
II. Low luminosity, high surface temperature
III. Exceptionally high luminosity and large radius
IV. Band running from top-left (hot/bright) to bottom-right (cool/dim)

(A) P-IV, Q-I, R-II, S-III
(B) P-III, Q-II, R-I, S-IV
(C) P-I, Q-IV, R-III, S-II
(D) P-II, Q-III, R-IV, S-I
(E) Answer not known

24. Identify the celestial object based on these features: It has incredibly high density, is formed from the collapsed core of a massive star after a supernova, and primarily consists of closely packed neutrons.
(A) Neutron Star
(B) White Dwarf
(C) Red Supergiant
(D) Brown Dwarf
(E) Answer not known

25. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.

Assertion (A): Elements heavier than iron are primarily synthesized during supernova explosions.

Reason (R): The temperatures and pressures during a supernova are immensely high, allowing rapid neutron capture processes to occur.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

26. Which of the following pairs of stellar remnants and their progenitor star masses is incorrectly matched?
(A) White Dwarf - Low to medium mass stars (like the Sun)
(B) Pulsar - Remnant of a small, low-mass red dwarf star
(C) Neutron Star - Massive stars (approx 8 to 20 solar masses)
(D) Black Hole - Very massive stars (greater than 20 solar masses)
(E) Answer not known

27. Identify the correct evolutionary sequence of a Sun-like star:
(A) Nebula, Protostar, Red Giant, Main Sequence, White Dwarf
(B) Nebula, Protostar, Main Sequence, Red Giant, White Dwarf
(C) Nebula, Main Sequence, Protostar, Supernova, Neutron Star
(D) Protostar, Nebula, Main Sequence, Red Supergiant, Black Hole
(E) Answer not known

28. Which of the following is a classic example of a Main Sequence star?
(A) Sirius B
(B) Betelgeuse
(C) The Sun
(D) Crab Pulsar
(E) Answer not known

29. Consider the following statements about Black Holes:
I. A black hole's gravitational pull is so strong that not even light can escape.
II. The boundary surrounding a black hole is

Downloaded from www.pdf.tube

called the event horizon.
III. Supermassive black holes are typically found at the centers of galaxies.
IV. Black holes are formed when low-mass stars exhaust their nuclear fuel.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) II, III and IV
(C) I and IV
(D) II and IV
(E) Answer not known

30. Match the solar system formation theories in List I with their proponents in List II:
List I: (Theory)
P. Nebular Hypothesis
Q. Planetesimal Hypothesis
R. Tidal Hypothesis
S. Dust Cloud Hypothesis
List II: (Proponents)
I. Chamberlin and Moulton
II. Jeans and Jeffreys
III. Carl von Weizsacker
IV. Immanuel Kant and Laplace
(A) P-IV, Q-I, R-II, S-III
(B) P-I, Q-IV, R-III, S-II
(C) P-IV, Q-II, R-I, S-III
(D) P-II, Q-III, R-IV, S-I
(E) Answer not known

31. Which of the following is the most relevant application of the Hertzsprung-Russell (H-R) diagram in astronomy?
(A) Determining the distance to neighboring galaxies
(B) Tracing the evolutionary stages and age of star clusters
(C) Mapping the distribution of dark matter in the universe
(D) Predicting the precise timing of meteor showers
(E) Answer not known

32. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): When a star the size of the Sun exhausts hydrogen in its core, it expands into a Red Giant.
Reason (R): Helium fusion begins immediately in the core, causing outer layers to contract and heat up.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

33. If a star is observed to have a distinct blue-white color, what can be inferred about its surface temperature compared to a red star?
(A) The blue-white star has a significantly higher surface temperature
(B) The blue-white star has a significantly lower surface temperature
(C) Both stars have the same surface temperature, but differ in composition
(D) The color indicates its distance, not its surface temperature
(E) Answer not known

34. Arrange the standard stellar spectral classifications in order of decreasing temperature (hottest to coolest):
1. G class
2. O class
3. M class
4. A class
(A) 2, 4, 1, 3
(B) 2, 1, 4, 3
(C) 3, 1, 4, 2
(D) 4, 2, 1, 3
(E) Answer not known

35. Which of the following pairs is correctly matched?
(A) Chandrasekhar Limit - 1.44 solar masses
(B) Type Ia Supernova - Triggered by core collapse of a massive star
(C) Type II Supernova - Occurs in binary systems involving a white dwarf
(D) Singularity - The expanding outer shell of a supernova remnant
(E) Answer not known

36. Consider the following statements regarding the Solar System's origin and structure:
I. It originated roughly 4.6 billion years ago from a giant interstellar molecular cloud.

NODIA

II. The vast majority of the system's mass is contained in Jupiter.
III. The inner planets are composed mostly of rock and metal.
IV. The Oort cloud marks the outermost region of the solar system.
V. The solar system orbits the center of the Milky Way galaxy.

Which of the above statement(s) is/are incorrect?
(A) I, III, IV and V
(B) I, II and IV
(C) II only
(D) III, IV and V
(E) Answer not known

37. What is a primary advantage of analyzing a star cluster's H-R diagram?
(A) It provides direct data regarding the cluster's total mass and gravitational constant
(B) It helps astronomers determine the cluster's age by locating the main sequence turnoff
(C) It reveals that all stars within the cluster formed at completely different epochs
(D) It helps detect the presence of exoplanets in the orbit of various cluster members
(E) Answer not known

38. Which of the following defines the "solar nebula"?
(A) A temporary dark spot on the Sun's photosphere with intense magnetic activity
(B) The outermost atmosphere of the Sun that remains visible during a total eclipse
(C) The rotating cloud of gas and dust from which the solar system originally formed
(D) A stream of charged particles released from the upper atmosphere of the Sun
(E) Answer not known

39. What does the Chandrasekhar limit specifically dictate in astrophysics?
(A) The maximum distance a planet can be from the Sun to remain in orbit
(B) The speed limit of the solar wind in the heliosphere
(C) The minimum mass required for a protostar to ignite nuclear fusion
(D) The maximum mass of a stable white dwarf star
(E) Answer not known

40. Excluding the Sun, which star is closest to our Solar System?
(A) Proxima Centauri
(B) Sirius
(C) Alpha Centauri A
(D) Barnard's Star
(E) Answer not known

41. Which of the following statements correctly identifies the chemical composition of the Sun?
(A) Roughly 73% Helium, 25% Hydrogen, and small amounts of heavier elements
(B) Roughly 73% Hydrogen, 25% Helium, and small amounts of heavier elements
(C) Roughly 50% Hydrogen and 50% Helium
(D) Predominantly Oxygen and Carbon with traces of Hydrogen
(E) Answer not known

42. Consider the following statements about the Sun's activity:
I. Solar wind is a continuous stream of charged particles released from the solar corona.
II. Sunspots appear darker because they are significantly hotter than the surrounding areas.
III. Solar flares can cause geomagnetic storms that affect Earth's satellite communications.

Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II only
(D) III only
(E) Answer not known

43. Match the planets in List I with their unique characteristics in List II:
List I: (Planet)
P. Mercury
Q. Venus
R. Mars
S. Jupiter
List II: (Characteristics)
I. Known as the Red Planet due to iron oxide on its surface
II. Has the Great Red Spot, a giant storm
III. Experiences extreme temperature variations and lacks an atmosphere
IV. Rotates in retrograde and has a runaway greenhouse effect
(A) P-III, Q-IV, R-I, S-II

Click Here to Buy book on Amazon

(B) P-IV, Q-III, R-II, S-I
(C) P-I, Q-II, R-III, S-IV
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

44. Which of the following statements regarding the inner planets is incorrect?
(A) They are solid, rocky planets known as terrestrial planets
(B) They have high densities compared to outer planets
(C) They possess numerous moons and elaborate ring systems
(D) Mercury, Venus, Earth, and Mars constitute the inner planets
(E) Answer not known

45. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Jupiter is categorized as a gas giant rather than a terrestrial planet.
Reason (R): Jupiter lacks a well-defined solid surface and is composed primarily of hydrogen and helium.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

46. Which of the following pairs of moons and their host planets is incorrectly matched?
(A) Phobos - Mars
(B) Ganymede - Jupiter
(C) Titan - Uranus
(D) Triton - Neptune
(E) Answer not known

47. Identify the correct sequence of the following planets in descending order of their physical size (largest to smallest):
(A) Jupiter, Saturn, Uranus, Neptune
(B) Saturn, Jupiter, Neptune, Uranus
(C) Jupiter, Uranus, Saturn, Neptune
(D) Uranus, Neptune, Saturn, Jupiter
(E) Answer not known

48. According to the International Astronomical Union (IAU), which of the following is NOT a condition for a celestial body to be defined as a planet?
(A) It must orbit the Sun
(B) It must have sufficient mass to assume hydrostatic equilibrium (a nearly round shape)
(C) It must have cleared the neighbourhood around its orbit
(D) It must possess at least one natural satellite
(E) Answer not known

49. Which of the following provides the best description of sunspots?
(A) Temporary dark, cool regions on the Sun caused by intense magnetic activity
(B) Localized areas of intense nuclear fusion occurring on the solar photosphere
(C) Permanent shadow regions on the Sun created by the transit of inner planets
(D) Massive eruptions of solar plasma that extend outward into the solar corona
(E) Answer not known

50. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Venus is the hottest planet in the solar system despite being further from the Sun than Mercury.
Reason (R): Venus has a dense atmosphere rich in carbon dioxide, which creates a strong greenhouse effect.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

51. If the Moon passes exactly between the Earth and the Sun, blocking the Sun's light from reaching Earth, which astronomical event is occurring?
(A) Lunar Eclipse
(B) Solar Eclipse
(C) Autumnal Equinox
(D) Solstice

Downloaded from www.pdf.tube

(E) Answer not known

52. Arrange the following planets in order of their increasing distance from the Sun:
1. Mars
2. Venus
3. Earth
4. Mercury

(A) 4, 2, 3, 1
(B) 4, 3, 2, 1
(C) 1, 3, 2, 4
(D) 2, 4, 1, 3
(E) Answer not known

53. Which of the following pairs concerning ISRO missions is correctly matched?
(A) Chandrayaan-1 - First Indian mission to study the Sun
(B) Aditya-L1 - Mission to explore the asteroid belt
(C) AstroSat - Mission exclusively for lunar surface mapping
(D) Mangalyaan - Mars Orbiter Mission
(E) Answer not known

54. Consider the following characteristics regarding Mars:
I. It is known as the Red Planet.
II. It has the largest volcano in the solar system, Olympus Mons.
III. Its atmosphere is primarily composed of Nitrogen.
IV. It has two small moons, Phobos and Deimos.
V. Liquid water flows abundantly on its surface today.

Which of the above statement(s) is/are incorrect?
(A) I, II, III and IV
(B) I, II and IV
(C) III and V
(D) III, IV and V
(E) Answer not known

55. The planets in our solar system are broadly classified into Terrestrial and Jovian planets. Which defining feature primarily distinguishes these two categories?
(A) The presence or absence of a magnetic field
(B) Density, composition, and physical size
(C) Orbital eccentricity and inclination
(D) The direction of rotation on their axes
(E) Answer not known

56. When comparing Mercury and the Earth's Moon, which of the following is a shared characteristic?
(A) Both have thick atmospheres protecting them from meteorites
(B) Both are heavily cratered and lack a significant atmosphere
(C) Both undergo plate tectonics and have active volcanoes
(D) Both possess strong, global dipole magnetic fields
(E) Answer not known

57. Titan is uniquely identified among all the moons in the solar system for possessing which specific feature?
(A) A dense, planet-like atmosphere consisting primarily of nitrogen
(B) Active subsurface oceans composed of molten iron and magnesium
(C) A stable retrograde orbit maintained around its primary host planet
(D) The largest and most complex system of rings surrounding a moon
(E) Answer not known

NODIA

58. Pluto, Ceres, and Eris belong to which category of celestial bodies as defined by the IAU?
(A) Terrestrial Planets
(B) Minor Asteroids
(C) Dwarf Planets
(D) Centaurs
(E) Answer not known

59. Why is the study of meteorites considered highly relevant in modern planetary science?
(A) They serve as the primary source for fossil fuel deposits currently found on Earth
(B) They determine and regulate the complex atmospheric weather patterns on our planet
(C) They allow scientists to map the general distribution of dark energy in space
(D) They provide physical evidence of the early solar system's composition and age
(E) Answer not known

60. Consider the following statements differentiating asteroids and comets:
I. Asteroids are primarily rocky and metallic, while comets are composed of ice, dust, and rocky material.

II. Comets develop a glowing coma and a tail when approaching the Sun.
III. Asteroids are mostly found in the Oort cloud, while comets reside in the asteroid belt.

Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II only
(D) III only
(E) Answer not known

61. Match the layers of the Earth in List I with their primary compositions in List II:
List I: (Layer of Earth)
P. Continental Crust
Q. Oceanic Crust
R. Mantle
S. Core
List II: (Primary Composition)
I. Iron and Nickel
II. Silicate rocks rich in magnesium and iron (peridotite)
III. Granitic rocks (silica and alumina)
IV. Basaltic rocks (silica and magnesia)
(A) P-III, Q-IV, R-II, S-I
(B) P-IV, Q-III, R-I, S-II
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

62. From the observation that Earth experiences a cycle of day and night, what can be fundamentally inferred?
(A) The Earth revolves around the Sun annually
(B) The Moon revolves around the Earth
(C) The Sun revolves around the Earth
(D) The Earth rotates on its own axis
(E) Answer not known

63. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The Earth experiences distinct seasons such as summer, winter, spring, and autumn.
Reason (R): The Earth's rotational axis is tilted at an angle of 23.5 degrees relative to its orbital plane.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

64. Which of the following pairs regarding meteor showers is incorrectly matched?
(A) Perseids - Associated with Comet Swift-Tuttle
(B) Leonids - Associated with Comet Tempel-Tuttle
(C) Orionids - Associated with Comet Hale-Bopp
(D) Geminids - Associated with the asteroid 3200 Phaethon
(E) Answer not known

65. Select the correct sequence of Earth's structural layers from the outermost to the innermost:
(A) Crust, Outer Core, Mantle, Inner Core
(B) Mantle, Crust, Outer Core, Inner Core
(C) Crust, Mantle, Outer Core, Inner Core
(D) Crust, Mantle, Inner Core, Outer Core
(E) Answer not known

66. What is a notable consequence (advantageous for specific observations) of the Moon's tidal locking to Earth?
(A) The Moon generates strong magnetic storms on Earth
(B) The Moon rotates much faster than the Earth
(C) The Moon avoids all asteroid impacts on its surface
(D) The same side of the Moon always faces the Earth
(E) Answer not known

67. Consider the following statements about tides on Earth:
I. Tides are primarily caused by the gravitational pull of the Moon and the Sun.
II. Spring tides occur when the Earth, Moon, and Sun are aligned.
III. Neap tides occur during the first and third quarter phases of the Moon.
IV. Spring tides result in the lowest high tides and highest low tides.

Which of the above statement(s) is/are incorrect?

Click Here to Buy book on Amazon

(A) I, II and III
(B) II and IV
(C) I and III
(D) IV only
(E) Answer not known

68. Match the Lunar Phases in List I with their visual descriptions in List II:
List I: (Lunar Phase)
P. New Moon
Q. First Quarter
R. Full Moon
S. Waning Crescent
List II: (Visual Description)
I. The entire illuminated portion faces the Earth
II. A small sliver of illumination is visible before it disappears completely
III. The unilluminated side faces the Earth, making the Moon invisible
IV. Exactly half of the Moon's visible disk is illuminated (right side in Northern Hemisphere)
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-I, Q-II, R-III, S-IV
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

69. How is a "meteoroid" strictly defined in astronomy?
(A) A streak of light produced in the atmosphere
(B) A remnant of a space rock that has landed on Earth's surface
(C) An icy body that outgases when near the Sun
(D) A small rocky or metallic body traveling through space
(E) Answer not known

70. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The Lonar Lake in Maharashtra, India, is a unique geological formation.
Reason (R): It was created by a meteorite impact during the Pleistocene Epoch.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

71. Which elements make up the bulk of the Earth's inner core?
(A) Silicon and Aluminum (Sial)
(B) Iron and Nickel (Nife)
(C) Silicon and Magnesium (Sima)
(D) Carbon and Iron
(E) Answer not known

NODIA

72. Arrange the following phases of the lunar cycle in sequential order starting from the New Moon:
1. First Quarter
2. Waxing Crescent
3. Full Moon
4. Waxing Gibbous
(A) 2, 1, 4, 3
(B) 1, 2, 4, 3
(C) 2, 4, 1, 3
(D) 1, 4, 2, 3
(E) Answer not known

73. Which of the following pairs is correctly matched regarding comets?
(A) Halley's Comet - Orbital period of approximately 76 years
(B) Coma - The solid core of a comet
(C) Kuiper Belt - The exclusive origin of all long-period comets
(D) Comet Tails - Always point towards the Sun
(E) Answer not known

74. Consider the following effects observed on Earth:
I. The succession of day and night.
II. The changing of seasons.
III. The apparent shifting of stellar constellations throughout the year.
IV. The Coriolis effect modifying wind directions.
V. The variation in the length of daylight throughout the year.
Which of the above statement(s) correctly list the effects of Earth's revolution around the Sun?
(A) I, II, III and IV
(B) II, III and V
(C) II, III, IV and V
(D) I, IV and V

(E) Answer not known

75. The Earth is not a perfect sphere but an oblate spheroid. This shape is primarily caused by:
(A) The gravitational pull of the Moon
(B) The uneven distribution of oceans and continents
(C) The magnetic pull from the North and South poles
(D) The centrifugal force generated by Earth's rotation
(E) Answer not known

76. Which of the following statements correctly identifies the location of the main asteroid belt?
(A) Between the orbits of Venus and Earth
(B) Between the orbits of Jupiter and Saturn
(C) Between the orbits of Mars and Jupiter
(D) Beyond the orbit of Neptune
(E) Answer not known

77. Which of the following statements about the Moon is incorrect?
(A) Its gravity is roughly one-sixth that of Earth
(B) It has a substantial atmosphere that traps heat during the lunar night
(C) It lacks a global magnetic field like Earth's
(D) The lunar surface is covered in a layer of fine dust called regolith
(E) Answer not known

78. Ocean tides on Earth are an important physical phenomenon. Which of the following is NOT a significant contributing factor to the formation of Earth's tides?
(A) Gravitational pull of the Moon
(B) Gravitational pull of the Sun
(C) Centrifugal force due to Earth's rotation
(D) The solar wind pressing on the oceans
(E) Answer not known

79. Under which of the following specific conditions does a total solar eclipse occur?
(A) The Moon passes directly between the Sun and Earth, completely covering the Sun's disk.
(B) The Earth passes directly between the Sun and Moon during its specific full moon phase.
(C) The Moon passes through the Earth's penumbral shadow during its periodic new moon phase.
(D) The Sun aligns with the galactic center, causing darkness across all the inner planets.
(E) Answer not known

80. Consider Kepler's laws of planetary motion:
I. The orbit of a planet is an ellipse with the Sun at one of the two foci.
II. A line segment joining a planet and the Sun sweeps out equal areas during equal intervals of time.
III. The square of a planet's orbital period is proportional to the cube of the length of the semi-major axis of its orbit.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) I only
(D) I, II and III
(E) Answer not known

81. Match Newton's Laws in List I with their corresponding definitions in List II:
List I: (Physical Law)
P. First Law of Motion
Q. Second Law of Motion
R. Third Law of Motion
S. Universal Law of Gravitation
List II: (Definition)
I. Force equals mass times acceleration (F=ma)
II. For every action, there is an equal and opposite reaction
III. Every mass attracts every other mass in the universe
IV. An object remains at rest or in uniform motion unless acted upon by a force
(A) P-IV, Q-I, R-II, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-II, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

82. Using Newton's Universal Law of Gravitation, if the distance between two celestial bodies is doubled, what happens to the gravitational force between them?
(A) It doubles
(B) It halves
(C) It remains unchanged

Downloaded from www.pdf.tube

(D) It reduces to one-fourth of its original value
(E) Answer not known

83. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A lunar eclipse does not occur every full moon.
Reason (R): The Moon's orbital plane is tilted by about 5 degrees relative to the Earth's orbital plane (the ecliptic).
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

84. Which of the following pairs of General Scientific Laws is correctly matched?
(A) Law of Conservation of Mass - Energy cannot be created or destroyed
(B) First Law of Thermodynamics - Matter cannot be created or destroyed
(C) Law of Conservation of Energy - The total energy of an isolated system remains constant
(D) Second Law of Thermodynamics - Absolute zero cannot be reached
(E) Answer not known

85. Select the correct sequence of astronomical distance units in increasing order of magnitude:
(A) Light Year, Astronomical Unit, Parsec
(B) Astronomical Unit, Light Year, Parsec
(C) Parsec, Light Year, Astronomical Unit
(D) Astronomical Unit, Parsec, Light Year
(E) Answer not known

86. Which branch of scientific laws focuses on the relationships between heat, work, temperature, and energy, fundamental to understanding stellar processes?
(A) Thermodynamics
(B) Quantum Mechanics
(C) Electromagnetism
(D) Fluid Dynamics
(E) Answer not known

87. Consider the following statements regarding astronomical measurements:
I. An Astronomical Unit (AU) is the mean distance between the Earth and the Sun.
II. A light-year is a unit of time measuring how long it takes light to travel from the Sun to Earth.
III. One light-year is approximately 9.46 trillion kilometers.
IV. Parsec is a unit of distance smaller than an Astronomical Unit.
Which of the above statement(s) is/are correct?
(A) I and III
(B) I, II and III
(C) II and IV
(D) I, III and IV
(E) Answer not known

88. Match the eclipse types in List I with their defining characteristics in List II:
List I: (Eclipse Type)
P. Total Solar Eclipse
Q. Annular Solar Eclipse
R. Partial Lunar Eclipse
S. Penumbral Lunar Eclipse
List II: (Characteristic)
I. Moon appears as a dark silhouette surrounded by a bright ring of fire
II. Observer falls entirely within the Moon's umbra
III. Moon passes only through the Earth's outer, lighter shadow
IV. Only a portion of the Moon enters Earth's umbra
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

89. When comparing 'G' (Universal Gravitational Constant) and 'g' (acceleration due to gravity), which statement is correct?
(A) 'G' is a universal constant, while 'g' varies with altitude and planetary mass.
(B) 'G' varies depending on the planet, whereas 'g' is constant throughout space.
(C) Both 'G' and 'g' represent the exact same physical quantity in classical physics.
(D) 'G' is only applicable to subatomic particles, while 'g' applies only to planets.

NODIA

(E) Answer not known

90. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A planet moves faster in its orbit when it is closer to the Sun (perihelion) and slower when it is farther away (aphelion).
Reason (R): Kepler's second law states that a line connecting a planet to the Sun sweeps out equal areas in equal intervals of time.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

91. What term is used to identify the narrow track on Earth's surface where an observer can experience a 100% total solar eclipse?
(A) The Penumbral Zone
(B) The Eclipse Equator
(C) The Corona Corridor
(D) The Path of Totality
(E) Answer not known

92. Arrange the following landmark scientific formulations in chronological order of their proposal:
1. Universal Law of Gravitation (Newton)
2. Laws of Planetary Motion (Kepler)
3. Heliocentric Theory (Copernicus)
4. General Relativity (Einstein)
(A) 3, 2, 1, 4
(B) 2, 3, 1, 4
(C) 3, 1, 2, 4
(D) 1, 3, 2, 4
(E) Answer not known

93. Which of the following pairs regarding shadow structures during an eclipse is incorrectly matched?
(A) Umbra - The fully shaded inner region of a shadow
(B) Macula - The primary shadow cast by the Earth onto the Sun
(C) Penumbra - The partially shaded outer region of a shadow
(D) Antumbra - The region from which the occulting body appears entirely within the disc of the light source
(E) Answer not known

94. Consider the applications of Newton's laws in space exploration:
I. Rockets launch into space by expelling exhaust gases downwards (Third Law).
II. A satellite in a frictionless vacuum continues its uniform motion without added fuel (First Law).
III. Calculating the thrust needed to accelerate a massive spacecraft (Second Law).
IV. Newton's laws perfectly describe planetary motion in extremely high gravitational fields like black holes.
V. The conservation of momentum allows maneuvering using thrusters.
Which of the above statement(s) is/are incorrect?
(A) I, II, III and V
(B) II, III, IV and V
(C) IV only
(D) I, III and IV
(E) Answer not known

95. The increase in rotational speed of a collapsing interstellar dust cloud (protostar) is an astronomical example of which fundamental principle?
(A) Conservation of Angular Momentum
(B) Conservation of Mass
(C) First Law of Thermodynamics
(D) Hubble's Law
(E) Answer not known

96. The value of the Universal Gravitational Constant (G) is fundamental to astrophysics. What is its accepted approximate value in SI units?
(A) $9.81\ m\ s^{-2}$
(B) $3.00 \times 10^{8}\ m\ s^{-1}$
(C) $6.674 \times 10^{-11}\ N\ m^{2}\ kg^{-2}$
(D) $1.602 \times 10^{-19}\ C$
(E) Answer not known

97. From Kepler's Third Law (P^2 is proportional to a^3), what can be directly inferred about the planets in our solar system?
(A) Planets with larger orbits have longer orbital periods

Click Here to Buy book on Amazon

(B) Planets with larger masses have shorter orbital periods
(C) All planets have perfectly circular orbits
(D) Gas giants rotate faster on their axes than terrestrial planets
(E) Answer not known

98. What is the primary advantage of using the Light Year over the Astronomical Unit (AU) when studying the universe?
(A) The Light Year is significantly more precise for measuring the distance of planets.
(B) The Light Year accounts for the expansion of the universe while the AU does not.
(C) The Light Year remains independent of the speed of light in most calculations.
(D) The Light Year scales appropriately to express vast interstellar and intergalactic units.
(E) Answer not known

99. Which of the following best defines a radio telescope?
(A) An instrument that captures visible light through the use of massive mirrors.
(B) An instrument used to detect radio-frequency radiation emitted by space sources.
(C) A satellite designed solely to intercept human radio communications from space.
(D) A ground-based device that measures seismic waves traveling from distant planets.
(E) Answer not known

100. Consider the following statements about major space observatories:
I. Hubble Space Telescope observes primarily in the visible and ultraviolet spectra.
II. James Webb Space Telescope (JWST) is designed to excel in high-resolution infrared observations.
III. Chandra X-ray Observatory studies extremely hot regions like exploding stars and galaxy clusters.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I, II and III
(D) I only
(E) Answer not known

NODIA

101. Match the scientific tools in List I with their purpose in List II:
List I: (Scientific Tool)
P. Carbon Dating
Q. Remote Sensing
R. Ice Cores
S. GPS
List II: (Purpose)
I. Determining the age of organic fossil remains
II. Understanding historical Earth climates by analyzing trapped air bubbles
III. Gathering data about Earth's surface from satellite-mounted sensors
IV. Determining precise locations on Earth for navigation
(A) P-I, Q-III, R-II, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-I, Q-IV, R-II, S-III
(D) P-III, Q-II, R-I, S-IV
(E) Answer not known

102. Which astronomer is famously credited with being the first to systematically use a telescope to observe celestial bodies, discovering Jupiter's largest moons?
(A) Galileo Galilei
(B) Nicolaus Copernicus
(C) Johannes Kepler
(D) Isaac Newton
(E) Answer not known

103. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Remote sensing satellites play a crucial role in modern agriculture in states like Tamil Nadu.
Reason (R): They can monitor crop health, assess soil moisture, and predict yields using multispectral imagery.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

104. Which of the following pairs of Indian observatories and their locations is incorrectly matched?
(A) Vainu Bappu Observatory - Kavalur, Tamil Nadu
(B) Solar Observatory - Nainital, Uttarakhand
(C) Giant Metrewave Radio Telescope (GMRT) - Pune, Maharashtra
(D) Indian Astronomical Observatory - Hanle, Ladakh
(E) Answer not known

105. Select the correct sequence of the historical evolution of optical telescopes:
(A) Refracting telescope, Reflecting telescope, Catadioptric telescope, Space-based optical telescope
(B) Reflecting telescope, Refracting telescope, Catadioptric telescope, Space-based optical telescope
(C) Catadioptric telescope, Refracting telescope, Reflecting telescope, Space-based optical telescope
(D) Refracting telescope, Catadioptric telescope, Reflecting telescope, Space-based optical telescope
(E) Answer not known

106. What is the approximate half-life of Carbon-14, which makes it a crucial tool for radiocarbon dating to understand the recent past?
(A) 1,200 years
(B) 10,000 years
(C) 5,730 years
(D) 4.5 billion years
(E) Answer not known

107. Consider the following statements about climate modelling:
I. It relies on complex mathematical algorithms representing physical processes.
II. Supercomputers are required to run high-resolution global climate models.
III. It perfectly predicts local weather conditions decades in advance with no uncertainty.
IV. It utilizes historical data from ice cores and tree rings for calibration.
Which of the above statement(s) is/are incorrect?
(A) I, II and IV
(B) I and III
(C) III only
(D) II and IV
(E) Answer not known

NODIA

108. Match the types of telescopes in List I with the celestial phenomena they are best suited to study in List II:
List I: (Telescope Type)
P. Optical Telescopes
Q. Radio Telescopes
R. X-ray Telescopes
S. Infrared Telescopes
List II: (Celestial Phenomena)
I. Black hole accretion disks and pulsars
II. Cosmic microwave background and pulsars
III. Star-forming regions obscured by dust clouds
IV. Visual mapping of lunar and planetary surfaces
(A) P-IV, Q-II, R-I, S-III
(B) P-I, Q-III, R-II, S-IV
(C) P-IV, Q-I, R-II, S-III
(D) P-II, Q-IV, R-III, S-I
(E) Answer not known

109. Which of the following statements correctly describes how ice cores act as a tool to understand the past?
(A) They provide frozen DNA samples belonging to extinct prehistoric dinosaurs.
(B) They contain trapped air bubbles that reveal historical atmospheric composition.
(C) They accurately record the impact of every historical meteor strike on Earth.
(D) They show the exact geographical dates regarding the Earth's initial formation.
(E) Answer not known

110. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Space-based telescopes are placed in orbit despite the high cost and maintenance challenges.
Reason (R): Earth's atmosphere absorbs and distorts many wavelengths of electromagnetic radiation, hindering ground-based observations.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

111. Which of the following statements regarding the Global Positioning System (GPS) is incorrect?
(A) It requires signals from only one satellite to determine a precise 3D location on Earth
(B) It relies on a constellation of satellites in medium Earth orbit
(C) A GPS receiver calculates position by measuring the time delay of signals from multiple satellites
(D) Einstein's theory of relativity is used to correct time measurements in GPS systems
(E) Answer not known

112. Arrange the following geological eras in chronological sequence from oldest to most recent, as studied through fossil records:
1. Mesozoic
2. Paleozoic
3. Cenozoic
4. Precambrian

(A) 4, 2, 1, 3
(B) 4, 1, 2, 3
(C) 2, 4, 1, 3
(D) 1, 2, 3, 4
(E) Answer not known

113. Which of the following pairs is correctly matched regarding Earth observation and communication?
(A) RISAT - Radar imaging satellite for agriculture and disaster management.
(B) INSAT - Primary satellite used for deep space astronomical observation.
(C) ASTROSAT - Dedicated weather forecasting satellite for the Indian region.
(D) Mangalyaan - Earth's geostationary communication and data relay satellite.
(E) Answer not known

114. Consider the following features of the James Webb Space Telescope (JWST):
I. It is an infrared observatory.
II. Its primary mirror is made of 18 gold-coated beryllium hexagonal segments.
III. It orbits the Earth in low Earth orbit similar to the Hubble telescope.
IV. It is positioned at the second Lagrange point (L2).
V. It is capable of looking further back in time to observe early galaxies.

Which of the above statement(s) is/are incorrect?
(A) I, II, IV and V
(B) I, II and V
(C) III only
(D) IV and V
(E) Answer not known

115. Predictive science relies on current data and models to forecast future events. Which of the following is NOT typically a domain of predictive science?
(A) Epidemiological modelling for disease spread
(B) Radiocarbon dating of Harappan artifacts
(C) Forecasting monsoon patterns in India
(D) Simulating future global temperature changes
(E) Answer not known

116. What is the most significant scientific value of studying fossil records?
(A) They provide an inexhaustible source of nuclear energy for future use.
(B) They demonstrate the continuous and unchanged nature of species over time.
(C) They offer empirical evidence for biological evolution and mass extinctions.
(D) They are the primary tool used for predicting future tectonic plate shifts.
(E) Answer not known

117. A Doppler Weather Radar (like the one deployed in Chennai) primarily uses which principle to forecast severe weather?
(A) Measuring the radioactive decay patterns found in airborne rain particles.
(B) Sensing the infrared heat emitted by clouds in the upper atmosphere levels.
(C) Measuring changes in Earth's gravitational field caused by dense cloud mass.
(D) Measuring frequency shifts of radar waves reflected by moving precipitation.
(E) Answer not known

118. Remote sensing can be active or passive. How is active remote sensing classified?
(A) It generates its own energy source to illuminate the target (e.g., Radar)

Downloaded from www.pdf.tube

(B) It relies on naturally emitted radiation like sunlight
(C) It requires human observers to actively measure data on the ground
(D) It only operates during active solar flares
(E) Answer not known

119. In cosmological terms, how does Dark Matter fundamentally differ from Dark Energy?
(A) Dark Matter accelerates expansion, while Dark Energy exerts gravitational pull.
(B) Dark Matter holds galaxies together, while Dark Energy drives cosmic expansion.
(C) Dark Matter emits X-rays, whereas Dark Energy primarily emits radio-wave data.
(D) Dark Matter exists in the solar system, while Dark Energy is in deep space.
(E) Answer not known

120. Consider the following observations supporting the existence of Dark Matter:
I. The flat rotation curves of spiral galaxies.
II. Gravitational lensing of background galaxies by galaxy clusters.
III. The accelerating expansion of the universe.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II and III
(D) III only
(E) Answer not known

121. Match the ancient Indian astronomers/scholars in List I with their contributions in List II:
List I: (Scholar)
P. Aryabhata
Q. Varahamihira
R. Brahmagupta
S. Bhaskaracharya
List II: (Contribution)
I. Siddhanta Shiromani
II. Brahmasphutasiddhanta (Rules for computing with zero)
III. Panchasiddhantika
IV. Arybhatiya
(A) P-IV, Q-III, R-II, S-I
(B) P-III, Q-IV, R-I, S-II
(C) P-I, Q-II, R-III, S-IV
(D) P-IV, Q-I, R-II, S-III
(E) Answer not known

122. The concept suggesting that our observable universe is just one of many distinct universes, each potentially having different physical laws, is known as:
(A) The Steady State Theory
(B) The Geocentric Model
(C) The Multiverse Theory
(D) The Nebular Hypothesis
(E) Answer not known

123. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Observations of distant supernovae indicate that the expansion of the universe is currently accelerating.
Reason (R): Dark energy, a mysterious repulsive force, is overcoming the gravitational attraction of matter on a cosmic scale.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

124. Which of the following pairs regarding the Jantar Mantar observatories built by Maharaja Jai Singh II is incorrectly matched?
(A) Jaipur - Contains the world's largest stone sundial (Vrihat Samrat Yantra)
(B) New Delhi - The first of the observatories built
(C) Mumbai - Primarily designed for naval astronomical navigation
(D) Ujjain - Located on the Tropic of Cancer
(E) Answer not known

125. Select the correct chronological sequence of these ancient Indian astronomers/mathematicians based on their active periods:
(A) Aryabhata, Brahmagupta, Varahamihira, Bhaskaracharya
(B) Aryabhata, Varahamihira, Brahmagupta, Bhaskaracharya
(C) Varahamihira, Aryabhata, Bhaskaracharya, Brahmagupta
(D) Brahmagupta, Aryabhata, Varahamihira, Bhaskaracharya

(E) Answer not known

126. The "Transit Method" and the "Radial Velocity (Doppler) Method" are primary scientific techniques used as tools for which category of astronomical discovery?
(A) Determining the age of the solar system
(B) Identifying black holes at galaxy centers
(C) Measuring the expansion rate of the universe
(D) Detecting exoplanets orbiting distant stars
(E) Answer not known

127. Consider the following statements regarding the Search for Extraterrestrial Intelligence (SETI) and Mars Exploration:
I. SETI primarily uses radio telescopes to listen for artificial signals from space.
II. The discovery of liquid water on Mars guarantees the current existence of Martian life.
III. Mars rovers like Perseverance are equipped with instruments to search for signs of ancient microbial life.
IV. The Drake Equation is often cited in discussions regarding the probability of finding intelligent ET life.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) II, III and IV
(C) I, III and IV
(D) I and IV
(E) Answer not known

128. Match the Mars exploration missions in List I with the corresponding space agency/country in List II:
List I: (Mission)
P. Mangalyaan (MOM)
Q. Perseverance
R. Hope Probe
S. Tianwen-1
List II: (Space Agency/Country)
I. NASA (USA)
II. ISRO (India)
III. CNSA (China)
IV. UAESA (United Arab Emirates)
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

129. Which equation is widely considered most relevant in the scientific debate concerning extraterrestrial life, as it estimates the number of active, communicative extraterrestrial civilizations in the Milky Way?
(A) The Drake Equation
(B) Hubble's Law
(C) Einstein's Mass-Energy Equivalence
(D) Schrödinger Equation
(E) Answer not known

130. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Aryabhata proposed that the apparent daily motion of the stars is due to the Earth's rotation on its own axis.
Reason (R): Ancient Indian astronomy was exclusively geocentric and firmly rejected any notion of Earth's motion.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

131. When an astronomer detects a regular, periodic dimming in the brightness of a star, what is the most logical inference using the transit method?
(A) The star is rapidly running out of the nuclear fuel required for fusion.
(B) An exoplanet is passing in front of the star and blocking some of its light.
(C) The star is pulsating due to the effects of extreme internal magnetic storms.
(D) A nearby black hole is actively consuming the star and its surrounding gas.
(E) Answer not known

132. Arrange the general stages of a robotic Mars surface exploration mission in sequential order:
3. Launch from Earth
1. Cruise phase through interplanetary space
2. Entry, Descent, and Landing (EDL)
4. Surface operations and scientific data collection

Click Here to Buy book on Amazon

(A) 3, 1, 2, 4
(B) 1, 3, 2, 4
(C) 3, 2, 1, 4
(D) 1, 2, 3, 4
(E) Answer not known

133. Which of the following pairs concerning ancient Indian astronomical instruments is correctly matched?
(A) Jai Prakash Yantra - An instrument used to measure local rainfall levels.
(B) Misra Yantra - An ancient telescope using refined glass lenses and mirrors.
(C) Ram Yantra - A device used solely to predict the timing of future eclipses.
(D) Samrat Yantra - A massive sundial used to measure local time accurately.
(E) Answer not known

134. Consider the contributions of Aryabhata to astronomy and mathematics:
I. He calculated the length of the sidereal year with high precision.
II. He provided the geometric rationale for solar and lunar eclipses.
III. He invented the first optical telescope.
IV. He formulated the concept of zero as a number in mathematical operations.
V. He stated that the Moon and planets shine by reflected sunlight.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) I, II and V
(C) II, III and IV
(D) I, IV and V
(E) Answer not known

135. What is a significant philosophical advantage of humanity's scientific search for extraterrestrial life?
(A) It guarantees an immediate and massive technological leap via alien contact.
(B) It helps humanity understand its place in the cosmos and unify perspectives.
(C) It provides a secondary Earth-like planet for immediate human colonization.
(D) It disproves the existence of dark matter and dark energy in the universe.
(E) Answer not known

136. How is 'Dark Matter' best defined based on our current understanding?
(A) Matter composed primarily of anti-protons and high-energy positrons.
(B) Invisible matter that does not emit light but exerts gravitational force.
(C) Interstellar dust clouds that block light originating from distant galaxies.
(D) Supermassive black holes that swallow all light within their event horizon.
(E) Answer not known

137. What was the name of India's first satellite, launched in 1975, named after a famous ancient Indian astronomer?
(A) Aryabhata
(B) Bhaskara
(C) Rohini
(D) INSAT-1A
(E) Answer not known

138. Which renowned ancient Indian astronomer authored the 'Panchasiddhantika', which summarizes five older astronomical treatises?
(A) Aryabhata
(B) Brahmagupta
(C) Varahamihira
(D) Lalla
(E) Answer not known

139. Which of the following statements correctly describes AstroSat?
(A) It is an ISRO rover currently exploring the lunar south pole
(B) It is a joint Indo-French mission to study ocean currents
(C) It is a ground-based radio telescope located in Pune
(D) It is India's first dedicated multi-wavelength space observatory
(E) Answer not known

140. Consider the following statements about the Giant Metrewave Radio Telescope (GMRT):
I. It is located near Pune, India.
II. It operates primarily in the X-ray spectrum.
III. It is operated by the National Centre for Radio Astrophysics (NCRA).
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III

NODIA

(C) II and III
(D) I only
(E) Answer not known

141. Match the Indian astronomical/space institutions in List I with their headquarters in List II:
List I: (Institution)
P. Inter-University Centre for Astronomy and Astrophysics (IUCAA)
Q. Indian Institute of Astrophysics (IIA)
R. Physical Research Laboratory (PRL)
S. Space Applications Centre (SAC)
List II: (Headquarters)
I. Bengaluru
II. Pune
III. Ahmedabad
IV. Ahmedabad (ISRO centre focused on payloads)
(A) P-II, Q-I, R-III, S-IV
(B) P-I, Q-II, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-III, R-I, S-IV
(E) Answer not known

142. Which of the following statements distinguishing astronomy from astrology is incorrect?
(A) Astronomy is a natural science based on empirical evidence and the scientific method
(B) Astrology claims that the positions of celestial bodies influence human affairs and destiny
(C) Astronomy uses mathematics, physics, and observational data to understand the universe
(D) Astrology is universally recognized as a rigorous sub-discipline of modern astrophysics
(E) Answer not known

143. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Astronomy is considered a robust scientific discipline.
Reason (R): Its theories and hypotheses, such as the Big Bang or planetary motion, are subject to falsifiability and rigorous observational testing.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

144. Which of the following pairs of modern Indian telescopes and their specific locations is incorrectly matched?
(A) Vainu Bappu Telescope - Kavalur, Tamil Nadu
(B) Ooty Radio Telescope - Udhagamandalam, Tamil Nadu
(C) Himalayan Chandra Telescope - Mount Abu, Rajasthan
(D) Devasthal Optical Telescope - Nainital, Uttarakhand
(E) Answer not known

145. Select the correct chronological sequence of the launch of the following major ISRO missions:
(A) Chandrayaan-1, Mangalyaan, AstroSat, Aditya-L1
(B) Mangalyaan, Chandrayaan-1, AstroSat, Aditya-L1
(C) Chandrayaan-1, AstroSat, Mangalyaan, Aditya-L1
(D) AstroSat, Chandrayaan-1, Mangalyaan, Aditya-L1
(E) Answer not known

146. Which of the following is an exception to the characteristics of a pseudoscience (like astrology) when compared to astronomy?
(A) A heavy reliance on anecdotal evidence rather than scientific testing.
(B) Resistance to modification when faced with strong and contrary evidence.
(C) Lack of a proposed physical mechanism that can be experimentally tested.
(D) Rigorous peer review and willingness to revise theories based on new data.
(E) Answer not known

147. Consider the following statements about the philosophical progress resulting from studying the universe:
I. The Copernican principle shifted humanity from a geocentric to a heliocentric

Downloaded from www.pdf.tube

worldview.
II. It demonstrated that Earth is not in a uniquely privileged central position in the universe.
III. Discovering the scale of the universe has led to a greater understanding of cosmic time scales.
IV. It proved definitively that human life exists on every planet in the Milky Way.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II, III and IV
(D) I and II
(E) Answer not known

148. Match the payloads of the Aditya-L1 mission in List I with their primary objectives in List II:
List I: (Payload)
P. Visible Emission Line Coronagraph (VELC)
Q. Solar Ultraviolet Imaging Telescope (SUIT)
R. Aditya Solar wind Particle Experiment (ASPEX)
S. Magnetometer (MAG)
List II: (Primary Objective)
I. To image the solar photosphere and chromosphere in near-UV
II. To study the solar corona and dynamics of Coronal Mass Ejections
III. To measure the interplanetary magnetic field at the L1 point
IV. To study the variation of solar wind properties and distribution
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

149. Which of the following is the most appropriate reason outlining the importance of studying the universe for technological progress?
(A) It provides accurate astrological charts for the better harvesting of crops.
(B) It leads directly to the discovery of the magical properties of meteorites.
(C) It remains the only viable way to harvest primary solar energy for the Earth.
(D) Space technologies result in spin-offs that benefit everyday life on Earth.
(E) Answer not known

150. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The Kodaikanal Solar Observatory has historically been a crucial center for astrophysics in India.
Reason (R): It facilitated the discovery of the Evershed effect, which describes the radial motion of gas in sunspots.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

151. Medical imaging technologies, such as digital mammography and MRI enhancements, apply concepts originally developed for which of the following space exploration tasks?
(A) Designing rocket fuel combustion chambers
(B) Processing degraded images of distant galaxies and stars
(C) Filtering zero-gravity water systems on the ISS
(D) Mining asteroids for precious metals
(E) Answer not known

152. Arrange the following regions of the electromagnetic spectrum studied by missions like AstroSat, from the lowest frequency (longest wavelength) to the highest frequency (shortest wavelength):
3. Radio Waves
1. Visible Light
4. Ultraviolet
2. X-Rays
(A) 3, 1, 4, 2
(B) 1, 3, 4, 2
(C) 3, 4, 1, 2
(D) 2, 4, 1, 3
(E) Answer not known

153. Which of the following pairs highlighting Tamil Nadu's contribution to astronomy is correctly matched?
(A) Kodaikanal Observatory - Operated by the Indian Institute of Astrophysics (IIA)
(B) Vainu Bappu Observatory - Located in the

Nilgiri Hills
(C) Ooty Radio Telescope - Designed exclusively for optical starlight capture
(D) Liquid Propulsion Systems Centre (Mahendragiri) - Headquarters of IUCAA
(E) Answer not known

154. Consider the following major Indian Space Science Missions:
I. Aditya-L1 is designed to study the solar atmosphere.
II. AstroSat is a multi-wavelength astronomy mission.
III. Chandrayaan-3 successfully demonstrated a soft landing near the lunar south pole.
IV. Gaganyaan aims to demonstrate human spaceflight capability.
V. XPoSat (X-ray Polarimeter Satellite) is designed to study the polarization of cosmic X-rays.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) I, II, III, IV and V
(C) I, II and IV
(D) II, III and V
(E) Answer not known

155. Astronomy can be broadly classified based on the wavelengths of electromagnetic radiation observed. The study of the Cosmic Microwave Background (CMB) falls under which branch?
(A) Optical Astronomy
(B) Gamma-ray Astronomy
(C) X-ray Astronomy
(D) Radio Astronomy
(E) Answer not known

156. When comparing the historical models of the universe, which defining characteristic separates the Ptolemaic model from the Copernican model?
(A) Ptolemaic is heliocentric, whereas Copernican is geocentric in its design.
(B) Both models placed the Earth at the center but differed on the Moon's path.
(C) Ptolemaic is geocentric, whereas the Copernican model is heliocentric.
(D) The Copernican model proved the existence of other galaxies in the universe.
(E) Answer not known

157. What specific role does the Inter-University Centre for Astronomy and Astrophysics (IUCAA) play in modern Indian astronomy?
(A) It manufactures various heavy launch vehicles used exclusively for ISRO.
(B) It promotes research and teaching in astronomy across Indian universities.
(C) It focuses on the astrological predictions required for Indian agriculture.
(D) It trains professional astronauts for the upcoming human Gaganyaan mission.
(E) Answer not known

158. Which of the following is a prominent example in the category of "space technology spin-offs" that benefits modern society?
(A) The initial invention of the mechanical printing press during the Renaissance.
(B) The medical discovery of penicillin used to treat various bacterial infections.
(C) The formulation of the periodic table used to classify all chemical elements.
(D) The development of memory foam originally created for NASA aircraft seating.
(E) Answer not known

159. Consider the following statements regarding exoplanets:
I. Exoplanets are planets that orbit stars other than the Sun.
II. The transit method detects exoplanets by observing a periodic decrease in a star's brightness.
III. All known exoplanets are located within the Milky Way Galaxy.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III
(E) Answer not known

160. The following question consists of two statements - Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Space telescopes can observe celestial objects more clearly than most ground-based telescopes.
Reason (R): Space telescopes operate above Earth's atmosphere, avoiding atmospheric distortion and absorption of electromagnetic

Click Here to Buy book on Amazon

radiation.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

www.nodia.in

Downloaded from www.pdf.tube

ANSWERS

1. (A) Expansion from an extremely hot, dense singularity 13.8 billion years ago
The Big Bang theory represents the prevailing cosmological model explaining the early development of the universe. It posits that approximately 13.8 billion years ago, the entire observable universe began as a microscopic, infinitely dense, and incredibly hot singularity. Since this initial event, the universe has been continuously expanding and cooling over billions of years to its current state.

2. (B) I and III
Scientific evidence for the origin of the universe includes the detection of Cosmic Microwave Background radiation, which is the afterglow of the initial expansion. Additionally, the observed abundance of light elements like hydrogen and helium matches theoretical predictions. The observed red shift of light from distant galaxies, rather than blue shift, further confirms that the universe is currently expanding.

3. (A) P-IV, Q-III, R-I, S-II
Spiral galaxies feature rotating disks and spiral arms, while elliptical galaxies consist mostly of older stars with minimal interstellar matter. Irregular galaxies lack a defined shape and contain significant gas and dust. Barred spirals are identified by a central bar-shaped stellar structure. These classifications allow astronomers to categorize galaxies based on their observable morphological and structural characteristics in the cosmos.

4. (D) 13.8 billion years
Current scientific estimations for the age of the universe are primarily derived from measurements of the cosmic microwave background radiation and the rate of cosmic expansion. By analyzing data from missions like the Planck satellite, astronomers have determined the universe is approximately 13.8 billion years old. This duration represents the time elapsed since the initial Big Bang expansion occurred.

5. (A) Both A and R are true and R is the correct explanation of A.
Light from distant galaxies exhibits a shift toward the red end of the spectrum because the universe is expanding. As galaxies move away from the observer, the electromagnetic waves of their emitted light are stretched, increasing their wavelength. This phenomenon, known as cosmological redshift, provides direct evidence that the space between galaxies is increasing over time in every direction.

6. (C) Galactic Halo - A flat disk containing predominantly young, hot stars
The Milky Way features several distinct structural components, including a galactic center, a flat disk with spiral arms, and a surrounding halo. The galactic halo is a roughly spherical region, not a flat disk, containing ancient stars and globular clusters. The solar system is located within the Orion Arm, while the central region contains the supermassive black hole Sagittarius A*.

7. (B) Cosmic inflation, Formation of neutral atoms, Formation of stars, Formation of galaxies
The timeline of the universe began with a period of rapid cosmic inflation followed by cooling. As the universe cooled, neutral atoms formed during the recombination epoch, allowing light to travel freely. Eventually, gravity caused matter to clump together, leading to the birth of the first stars and the subsequent assembly of these stars into large-scale structures known as galaxies.

8. (A) The rate at which the universe is currently expanding
The Hubble constant is a fundamental parameter in cosmology that quantifies the current rate of the universe's expansion. It expresses the relationship between the distance of a galaxy and the velocity at which it is receding from an observer. Measuring this constant is essential for estimating the age of the universe and understanding the fundamental nature of cosmic expansion.

NODIA

9. (B) I and IV
The Milky Way is scientifically classified as a barred spiral galaxy, not an elliptical one, and contains hundreds of billions of stars. It is part of the Local Group and is currently moving toward a future interaction with the Andromeda galaxy. While many features are well-understood, its precise classification and dynamic interactions with neighboring galaxies remain key areas of astronomical research.

10. (A) P-III, Q-II, R-I, S-IV
Different space telescopes are designed to detect specific wavelengths of the electromagnetic spectrum. The Hubble telescope observes primarily in optical and ultraviolet light, while the James Webb telescope focuses on high-resolution infrared. The Chandra Observatory detects high-energy X-rays from hot cosmic regions, and the Spitzer telescope was specialized for mid to far-infrared observations of dust-covered astronomical objects.

11. (A) The recessional velocity of a galaxy is directly proportional to its distance from Earth
Edwin Hubble's landmark observation revealed that distant galaxies are moving away from Earth at speeds proportional to their distance. This relationship, known as Hubble's Law, indicates that more distant galaxies recede faster than those closer to us. This fundamental principle provided the first strong observational evidence for an expanding universe, shifting our understanding of the cosmos and its dynamic nature.

12. (A) Both A and R are true and R is the correct explanation of A.
Stars in the outer regions of the Milky Way rotate at unexpectedly high speeds that cannot be explained by visible matter alone. This observation suggests the presence of a massive, invisible halo of dark matter surrounding the galaxy. The gravitational pull exerted by this dark matter provides the necessary force to maintain the high orbital velocities of these distant stars.

13. (D) The entire universe is physically bounded by a rigid outer edge
The universe does not possess a known physical boundary or rigid outer edge. Current scientific understanding suggests that the observable universe is limited by the cosmic light horizon, which is the distance light has traveled since the Big Bang. While the universe expanded faster than light during the inflation epoch, its overall physical extent remains a topic of ongoing theoretical study.

14. (A) 1, 3, 2, 4
Celestial structures are organized hierarchically based on their scale. The solar system is contained within the Milky Way galaxy, which is one of dozens of galaxies in the Local Group. The Local Group itself is part of much larger structures, such as the Laniakea Supercluster. This progression from smaller systems to massive cosmic clusters reflects the large-scale organization of matter.

15. (B) Magellanic Clouds - Dwarf irregular galaxies
Galaxies are classified based on their visual morphology and size. The Milky Way and Andromeda are spiral galaxies, while the Magellanic Clouds are classified as dwarf irregular galaxies because they lack a distinct, symmetric shape. Proper classification is vital for understanding the formation, evolution, and gravitational interactions of different galactic systems found throughout the vast reaches of the observable universe.

16. (A) I, II, III and IV
The Big Bang theory describes an expansion from a singularity and is supported by cosmic microwave background radiation. The Steady State theory suggests the continuous creation of matter to maintain a constant density. The Pulsating theory proposes cycles of expansion and contraction. Among these, the Big Bang theory remains the most widely accepted model within the global scientific community today.

17. (A) Hexagonal
The Hubble sequence is a morphological classification scheme developed to categorize galaxies based on their visual appearance. This system includes three primary types: spiral, elliptical, and lenticular galaxies, along with irregular galaxies that do not fit into these categories. Hexagonal is not a recognized morphological shape for galaxies within this standard scientific framework used by astronomers to study galactic structures.

Click Here to Buy book on Amazon

18. (C) Stretching of light wavelengths due to a source moving away from the observer
Redshift occurs when the light emitted by an object is stretched as the object moves away from the observer. This stretching increases the wavelength of the light, shifting it toward the red end of the electromagnetic spectrum. In astronomy, this phenomenon is a primary tool used to measure the expansion of the universe and the recessional velocities of distant galaxies.

19. (A) The star is moving towards the observer
The Doppler effect describes how the observed frequency of waves changes based on the relative motion between the source and the observer. When a star moves toward an observer, its light waves are compressed, leading to shorter wavelengths and a shift toward the blue end of the spectrum. This blueshift indicates an approaching object, contrasting with the redshift seen in receding objects.

20. (D) Barred spiral galaxy
Based on extensive observational data, astronomers have classified the Milky Way as a barred spiral galaxy. This structure consists of a central bar-shaped region composed of stars, with spiral arms extending outward from the ends of the bar. This specific classification distinguishes it from simple spiral galaxies, elliptical galaxies, and irregular galaxies, providing a clearer picture of our galactic home's architecture.

21. (B) Stars generate their own light via fusion, while planets reflect stellar light
Stars are massive celestial bodies that generate their own energy and light through nuclear fusion in their cores. In contrast, planets are smaller, non-luminous bodies that do not undergo fusion. Instead, planets become visible by reflecting the light produced by the stars they orbit. This fundamental difference in energy production is the primary distinction between stars and planetary bodies.

22. (D) II only
Stars originate within massive interstellar clouds known as nebulae, composed of gas and dust. As a protostar collapses under the force of gravity, its core temperature increases significantly due to gravitational energy conversion. Once temperatures become high enough to trigger hydrogen fusion, the star enters the main sequence. Therefore, the claim that core temperature decreases during the collapse phase is incorrect.

23. (A) P-IV, Q-I, R-II, S-III
The Hertzsprung-Russell diagram organizes stars by their luminosity and temperature. Main sequence stars form a continuous band, while red giants have high luminosity but low surface temperatures. White dwarfs are characterized by low luminosity and high temperatures. Supergiants are exceptionally large and bright. Analyzing these positions helps astronomers determine the evolutionary stage and physical properties of stars across the universe.

NODIA

24. (A) Neutron Star
A neutron star is an incredibly dense celestial object formed from the collapsed core of a massive star following a supernova. These remnants consist almost entirely of neutrons packed tightly together. Due to their extreme density, a small amount of neutron star material would have an immense mass. They represent one of the final evolutionary stages for stars of high initial mass.

25. (A) Both A and R are true and R is the correct explanation of A.
While stars produce lighter elements through fusion, elements heavier than iron require extreme conditions for synthesis. These conditions occur during supernova explosions, where immense temperatures and pressures facilitate rapid neutron capture. This process allows for the creation of heavy elements, which are then dispersed into space, eventually becoming part of new stars, planets, and even biological life on Earth.

26. (B) Pulsar - Remnant of a small, low-mass red dwarf star
The life cycle of a star is determined by its initial mass. Low to medium mass stars eventually become white dwarfs. Massive stars, ranging from eight to twenty solar masses, undergo supernova explosions and leave behind neutron stars. Pulsars are highly magnetized, rotating neutron stars. They do not originate from small red dwarf stars, which lack the mass required for such remnants.

27. (B) Nebula, Protostar, Main Sequence, Red Giant, White Dwarf
A Sun-like star begins its life in a nebula, where gas and dust collapse to form a protostar. It then enters the main sequence phase, fusing hydrogen for billions of years. As fuel is exhausted, it expands into a red giant. Finally, after shedding its outer layers, it leaves behind a dense, hot core known as a white dwarf.

28. (C) The Sun
The Sun is a classic example of a main sequence star, currently in the stable phase of its life cycle where it fuses hydrogen into helium in its core. This phase represents the longest period in a star's existence. Most stars in the universe, including our Sun, spend the majority of their lives on the main sequence of the Hertzsprung-Russell diagram.

29. (A) I, II and III
Black holes possess such intense gravitational fields that nothing, including light, can escape once it crosses the event horizon. Supermassive black holes are commonly found at the centers of most galaxies. These exotic objects form from the gravitational collapse of very massive stars at the end of their lives, rather than from low-mass stars which eventually become white dwarfs instead.

30. (A) P-IV, Q-I, R-II, S-III
Various scientific theories explain the origin of the solar system. The Nebular Hypothesis was proposed by Kant and Laplace, while Chamberlin and Moulton developed the Planetesimal Hypothesis. Jeans and Jeffreys proposed the Tidal Hypothesis, and von Weizsacker introduced the Dust Cloud Hypothesis. Each theory offers different mechanisms for how the Sun and planets formed from primitive cosmic material long ago.

31. (B) Tracing the evolutionary stages and age of star clusters
The Hertzsprung-Russell diagram is a vital tool for astronomers to study stellar evolution. By plotting the luminosity and temperature of stars within a cluster, scientists can identify their current developmental stages. Specifically, the point where stars leave the main sequence, known as the turnoff point, provides an accurate way to determine the overall age of the entire star cluster.

32. (C) A is true but R is false.
As a Sun-sized star depletes hydrogen in its core, the core contracts while the outer layers expand and cool, forming a red giant. This process is driven by hydrogen shell burning. While helium fusion eventually occurs, it does not happen immediately or cause the initial expansion. Therefore, the assertion regarding the expansion is accurate, while the provided reasoning is scientifically flawed.

33. (A) The blue-white star has a significantly higher surface temperature
The color of a star is a direct indicator of its surface temperature. Blue and white stars are significantly hotter than red stars, as they emit more energy at shorter wavelengths. This relationship between color and temperature is a fundamental principle in stellar physics, allowing astronomers to estimate the thermal properties of stars simply by observing their spectral characteristics and visual appearance.

34. (A) 2, 4, 1, 3
Stars are classified into spectral classes based on their temperature, using the sequence O, B, A, F, G, K, M. In this system, O-class stars are the hottest, while M-class stars are the coolest. Arranging the classes O, A, G, and M in this specific order correctly demonstrates a progression from the highest surface temperatures to the lowest ones observed.

35. (A) Chandrasekhar Limit - 1.44 solar masses
The Chandrasekhar limit, approximately 1.44 solar masses, represents the maximum mass a stable white dwarf star can reach before collapsing. Beyond this limit, electron degeneracy pressure can no longer support the star against gravity. This fundamental concept is crucial for understanding the final stages of stellar evolution and the triggers for specific types of energetic events like Type Ia supernovae.

36. (C) II only
The solar system formed from a giant molecular cloud approximately 4.6 billion years ago. While Jupiter is the largest planet, the Sun contains over ninety-nine percent of the total mass of

Downloaded from www.pdf.tube

the entire system. Terrestrial planets occupy the inner region, while the Oort cloud defines the outer limits. The system orbits the center of the Milky Way galaxy in a continuous cycle.

37. (B) It helps astronomers determine the cluster's age by locating the main sequence turnoff
Analyzing the Hertzsprung-Russell diagram of a star cluster is a primary method for determining its age. Because stars within a cluster form at roughly the same time, the location where they begin to move away from the main sequence provides a clear chronological marker. This turnoff point allows astronomers to calculate how long the cluster has existed since its formation.

38. (C) The rotating cloud of gas and dust from which the solar system originally formed
The solar nebula is defined as the massive, rotating cloud of interstellar gas and dust that eventually collapsed under gravity to form our solar system. As this nebula contracted, it flattened into a disk, with the Sun forming at the center and the planets accumulating from the surrounding material. This process is the foundation of the modern nebular hypothesis of formation.

39. (D) The maximum mass of a stable white dwarf star
The Chandrasekhar limit is a fundamental astrophysical constant that defines the maximum mass a white dwarf can possess while remaining stable. Calculated at approximately 1.44 times the mass of the Sun, this limit is where gravitational forces overcome the electron degeneracy pressure. Understanding this threshold is vital for predicting the ultimate fate of low to medium-mass stars in space.

40. (A) Proxima Centauri
Proxima Centauri is a small, low-mass star located approximately 4.24 light-years away, making it the closest known star to our solar system, excluding the Sun. It is part of the Alpha Centauri triple star system. Despite its proximity, it is a red dwarf star and is too faint to be seen from Earth without the aid of a telescope.

41. (B) Roughly 73% Hydrogen, 25% Helium, and small amounts of heavier elements
The Sun is primarily composed of light elements, with hydrogen and helium making up the vast majority of its mass. This chemical composition is typical for most stars in their main sequence phase. The remaining small percentage consists of heavier elements, often referred to as metals in astronomical terms, including oxygen, carbon, neon, and iron, distributed throughout the solar interior.

42. (B) I and III
Solar wind is a continuous flow of charged particles from the Sun's corona that permeates the solar system. Solar flares are sudden eruptions of energy that can disrupt Earth's magnetic field and communications. Sunspots are regions of intense magnetic activity that appear darker because they are cooler than the surrounding photosphere. Therefore, sunspots are not hotter than their surroundings as claimed.

43. (A) P-III, Q-IV, R-I, S-II
Each planet in the solar system has unique defining characteristics. Mercury lacks an atmosphere and experiences extreme temperatures. Venus has a thick carbon dioxide atmosphere and rotates in retrograde. Mars is recognized by its reddish surface due to iron oxide. Jupiter is the largest planet and features the Great Red Spot. These traits help scientists distinguish between the various planetary bodies.

44. (C) They possess numerous moons and elaborate ring systems
The inner planets, which include Mercury, Venus, Earth, and Mars, are characterized as terrestrial bodies composed of rock and metal. They have high densities and solid surfaces but lack the elaborate ring systems found around gas giants. Furthermore, inner planets have very few natural satellites, with Mercury and Venus possessing no moons and Mars having only two small ones.

45. (A) Both A and R are true and R is the correct explanation of A.
Jupiter is classified as a gas giant because it consists primarily of hydrogen and helium, mirroring the composition of the Sun. Unlike terrestrial planets, it lacks a solid, well-defined surface. Its immense mass and low density are

NODIA

characteristic of Jovian planets, which formed in the outer solar system where volatile materials could accumulate in large quantities during early formation stages.

46. (C) Titan - Uranus
Natural satellites are gravitationally bound to specific planets within our solar system. Phobos orbits Mars, Ganymede is a moon of Jupiter, and Triton belongs to Neptune. Titan, however, is the largest moon of Saturn, not Uranus. Uranus has its own system of moons, including Titania and Oberon. Correctly matching moons to their host planets is fundamental for planetary science and exploration.

47. (A) Jupiter, Saturn, Uranus, Neptune
The gas and ice giants of the outer solar system are significantly larger than the inner terrestrial planets. Among these, Jupiter is the largest, followed by Saturn. Uranus and Neptune are smaller than the two gas giants but still much larger than Earth. This sequence correctly identifies the descending order of physical size for the four major outer planets in our system.

48. (D) It must possess at least one natural satellite
The International Astronomical Union established three specific criteria for a celestial body to be classified as a planet. It must orbit the Sun, possess enough mass for hydrostatic equilibrium, and clear its orbital neighborhood of other debris. Possessing a natural satellite or moon is not a requirement for planetary status, as demonstrated by the planets Mercury and Venus in our solar system.

49. (A) Temporary dark, cool regions on the Sun caused by intense magnetic activity
Sunspots are temporary phenomena occurring on the Sun's photosphere. They appear as dark spots because they are significantly cooler than the surrounding areas, though they are still extremely hot. These regions are caused by intense magnetic activity that inhibits convection, preventing hotter gases from reaching the surface. Monitoring sunspots is essential for understanding solar cycles and their impact on space weather.

50. (A) Both A and R are true and R is the correct explanation of A.
Venus is the hottest planet in our solar system despite Mercury being closer to the Sun. This extreme temperature is caused by a dense atmosphere primarily composed of carbon dioxide, which traps heat through a powerful greenhouse effect. This thermal blanket keeps the surface temperature of Venus consistently high, demonstrating how atmospheric composition can significantly influence a planet's overall climate and environment.

51. (B) Solar Eclipse
A solar eclipse occurs when the Moon passes directly between the Earth and the Sun, casting a shadow on the Earth's surface and temporarily blocking the Sun's light. This event can only happen during the new moon phase. Depending on the alignment and distances, the eclipse may be total, partial, or annular, providing a spectacular demonstration of celestial mechanics in motion.

52. (A) 4, 2, 3, 1
The terrestrial planets of the inner solar system are positioned at varying distances from the Sun. Mercury is the closest, followed by Venus and then Earth. Mars is the outermost of the terrestrial planets. Arranging them in the order of Mercury, Venus, Earth, and then Mars correctly reflects their increasing orbital distances from the Sun within our solar system's structure.

53. (D) Mangalyaan - Mars Orbiter Mission
India's space program includes several landmark missions with specific objectives. Mangalyaan, also known as the Mars Orbiter Mission, was ISRO's successful first mission to explore the Red Planet. Other missions include Chandrayaan for lunar exploration and Aditya-L1 for studying the Sun. Correctly identifying these missions and their primary targets is essential for understanding India's significant contributions to global space exploration and science.

54. (C) III and V
Mars is characterized by its reddish appearance due to iron oxide and hosts the massive volcano Olympus Mons. It possesses two small moons, Phobos and Deimos. However, its atmosphere consists mainly of carbon dioxide, not nitrogen.

Click Here to Buy book on Amazon

Furthermore, scientific evidence indicates that while liquid water existed in the past, it does not flow abundantly on the surface under current atmospheric conditions today.

55. (B) Density, composition, and physical size
Planets in our solar system are divided into two main groups based on their physical properties. Terrestrial planets are small, dense, and composed of rock and metal. In contrast, Jovian planets are much larger, have lower densities, and consist primarily of gases and ices. These fundamental differences in density, composition, and size are the primary criteria used for this classification.

56. (B) Both are heavily cratered and lack a significant atmosphere
Mercury and the Earth's Moon share several physical similarities despite their different locations. Both celestial bodies are characterized by heavily cratered surfaces, resulting from billions of years of meteorite impacts. Additionally, they both lack a significant atmosphere, which means they have no weather patterns and are exposed to the vacuum of space, leading to extreme temperature variations between day and night.

57. (A) A dense, planet-like atmosphere consisting primarily of nitrogen
Titan, the largest moon of Saturn, is unique in the solar system for possessing a dense, substantial atmosphere. This atmosphere is primarily composed of nitrogen, much like Earth's, but it also contains methane and other hydrocarbons. Titan is the only known moon with such a thick atmosphere and stable liquid lakes on its surface, making it a primary target for research.

58. (C) Dwarf Planets
The International Astronomical Union classifies celestial bodies like Pluto, Ceres, and Eris as dwarf planets. These objects orbit the Sun and have sufficient mass to assume a nearly round shape, but they have not cleared their orbital paths of other debris. This classification distinguishes them from major planets and smaller solar system bodies, reflecting their unique status within our celestial neighborhood.

59. (D) They provide physical evidence of the early solar system's composition and age
Meteorites are invaluable to planetary science because they are remnants of the early solar system. By analyzing their chemical and isotopic composition, scientists can determine the age of the solar system and understand the primitive materials that formed the planets. They provide direct physical evidence that helps reconstruct the history and evolution of our cosmic environment over billions of years.

60. (A) I and II
Asteroids and comets differ primarily in their composition and behavior. Asteroids are rocky and metallic bodies mostly found in the asteroid belt. Comets are composed of ice and dust, developing a glowing coma and tail when they approach the Sun. While asteroids are concentrated between Mars and Jupiter, comets typically originate from the distant Oort cloud and Kuiper belt regions.

61. (A) P-III, Q-IV, R-II, S-I
Earth's structure consists of layers with distinct chemical compositions. The continental crust is made of granitic rocks, while the oceanic crust is primarily basaltic. The mantle is composed of silicate rocks rich in magnesium and iron. The core consists mainly of iron and nickel. Understanding these compositions is essential for studying plate tectonics, geomagnetism, and the planet's overall geological history.

62. (D) The Earth rotates on its own axis
The regular cycle of day and night on Earth is a direct result of the planet's rotation on its axis. As the Earth spins, different parts of its surface are alternately exposed to sunlight and turned away from it. This fundamental motion occurs once every twenty-four hours, creating the daily cycle that governs biological rhythms and environmental conditions across the entire planet.

63. (A) Both A and R are true and R is the correct explanation of A.
The Earth's seasonal changes are primarily caused by the 23.5-degree tilt of its rotational axis relative to its orbital plane. As the Earth revolves around the Sun, this tilt causes different hemispheres to receive varying amounts of solar radiation throughout the year. This variation in

NODIA

light and heat intensity results in the predictable cycle of summer, winter, spring, and autumn.

64. (C) Orionids - Associated with Comet Hale-Bopp
Meteor showers occur when Earth passes through the debris left behind by comets or asteroids. The Perseids are linked to Comet Swift-Tuttle, and the Leonids are associated with Comet Tempel-Tuttle. The Orionids are actually caused by debris from Halley's Comet, not Comet Hale-Bopp. Geminids are unique as they originate from an asteroid. Correctly identifying these sources is vital for meteor astronomy.

65. (C) Crust, Mantle, Outer Core, Inner Core
Earth is organized into several distinct layers based on their physical and chemical properties. The outermost layer is the thin, solid crust, followed by the thick, semi-solid mantle. Beneath the mantle lies the liquid outer core, and at the very center is the solid inner core. This sequence from the surface to the center reflects the planet's internal structure and density.

66. (D) The same side of the Moon always faces the Earth
Tidal locking is a phenomenon where a celestial body's rotational period matches its orbital period. Because the Moon is tidally locked to Earth, it completes one rotation on its axis in the same time it takes to orbit our planet. Consequently, the same side of the Moon always faces Earth, while the far side remains permanently hidden from our ground-based view.

67. (D) IV only
Tides are generated by the gravitational interactions between the Earth, Moon, and Sun. Spring tides occur during the alignment of these three bodies, leading to the highest high tides and lowest low tides. Neap tides occur when the Sun and Moon are at right angles. The claim that spring tides result in the lowest high tides is scientifically incorrect and inaccurate.

68. (A) P-III, Q-IV, R-I, S-II
Lunar phases are determined by the changing relative positions of the Earth, Moon, and Sun. During a new moon, the unilluminated side faces Earth. The first quarter shows half illumination, while the full moon reveals the entire illuminated side. A waning crescent appears as a small sliver before disappearing. Understanding these phases is essential for tracking time and observing celestial patterns from Earth.

69. (D) A small rocky or metallic body traveling through space
In astronomical terminology, a meteoroid is defined as a small rocky or metallic body traveling through outer space. These objects are smaller than asteroids but larger than interstellar dust. When a meteoroid enters Earth's atmosphere and vaporizes, it produces a streak of light called a meteor. If any part survives the atmospheric passage and reaches the ground, it is called a meteorite.

NODIA

70. (A) Both A and R are true and R is the correct explanation of A.
Lonar Lake in Maharashtra is a significant geological site because it is one of the few high-velocity impact craters in basaltic rock on Earth. It was formed during the Pleistocene Epoch when a meteorite struck the region. This impact created a unique saline lake within the crater, providing scientists with a rare opportunity to study impact processes and their environmental effects.

71. (B) Iron and Nickel (Nife)
The Earth's inner core is a solid sphere composed almost entirely of iron and nickel. This composition is often referred to by the acronym "Nife," representing the chemical symbols for these two metals. The extreme pressure at the planet's center keeps this layer in a solid state despite incredibly high temperatures. This metallic core is essential for generating Earth's protective magnetic field.

72. (A) 2, 1, 4, 3
After a new moon, the visible portion of the Moon increases through several distinct stages. First, a thin waxing crescent appears, followed by the first quarter phase when half the Moon is visible. The illumination continues to grow into a waxing gibbous before reaching the full moon phase. This sequence accurately reflects the progression of the lunar cycle as observed from Earth.

73. (A) Halley's Comet - Orbital period of approximately 76 years
Comets are icy bodies with highly elliptical orbits. Halley's Comet is a famous short-period

comet that returns to the inner solar system approximately every seventy-six years. Other characteristics of comets include the coma, which is the atmosphere surrounding the nucleus, and tails that always point away from the Sun due to solar wind. Long-period comets typically originate from the distant Oort cloud region.

74. (B) II, III and V
The revolution of the Earth around the Sun, combined with its axial tilt, results in several observable phenomena. These include the changing of seasons, shifts in the visible constellations throughout the year, and variations in the length of daylight hours. The succession of day and night and the Coriolis effect are primarily consequences of the Earth rotating on its own axis.

75. (D) The centrifugal force generated by Earth's rotation
The Earth's shape is an oblate spheroid, meaning it is slightly flattened at the poles and bulging at the equator. This deviation from a perfect sphere is caused by the centrifugal force generated by the Earth's rotation on its axis. This force acts outward from the axis of rotation, leading to a redistribution of mass that creates the observed equatorial bulge.

76. (C) Between the orbits of Mars and Jupiter
The main asteroid belt is a vast region in the solar system located between the orbits of Mars and Jupiter. It contains millions of rocky bodies, ranging in size from small dust particles to large dwarf planets like Ceres. This belt represents material that never formed into a planet due to the strong gravitational influence of nearby Jupiter during the solar system's formation.

77. (B) It has a substantial atmosphere that traps heat during the lunar night
The Moon possesses several distinct physical characteristics, including gravity that is about one-sixth of Earth's and a surface covered in fine dust called regolith. Unlike Earth, the Moon lacks a global magnetic field and a substantial atmosphere. Without an atmosphere to trap heat, the lunar surface experiences extreme temperature swings, becoming incredibly hot during the day and freezing during the night.

78. (D) The solar wind pressing on the oceans
Ocean tides are primarily generated by the gravitational attraction of the Moon and the Sun acting on Earth's water bodies. Centrifugal forces resulting from the Earth's rotation also play a critical role in tide formation. However, solar wind consists of charged particles from the Sun and does not exert any significant physical pressure on the oceans to contribute to tidal cycles on our planet.

79. (A) The Moon passes directly between the Sun and Earth, completely covering the Sun's disk.
A total solar eclipse occurs when the Moon's orbital path brings it directly between the Sun and Earth. During this specific alignment, the Moon completely obscures the Sun's bright disk from the perspective of an observer on Earth. This rare event allows the Sun's outer atmosphere, the corona, to become visible, creating a temporary period of darkness during the day.

80. (D) I, II and III
Kepler's laws of planetary motion provide a fundamental description of how planets orbit the Sun. These include the law of ellipses, the law of equal areas, and the harmonic law relating orbital periods to distances. These three laws accurately describe the motions of all planets in the solar system and were essential for the later development of Newton's universal law of gravitation.

81. (A) P-IV, Q-I, R-II, S-III
Newton's laws provide the foundation for classical mechanics. The first law defines inertia, while the second relates force to mass and acceleration. The third law states that actions have equal and opposite reactions. The universal law of gravitation describes the attraction between all masses. Together, these principles explain everything from planetary orbits to the motion of everyday objects on the Earth's surface.

82. (D) It reduces to one-fourth of its original value
According to Newton's Universal Law of Gravitation, the force of attraction between two masses is inversely proportional to the square of the distance between their centers. Therefore, if the distance between two celestial bodies is doubled, the gravitational force is reduced by a factor of four. This inverse-square relationship

Downloaded from www.pdf.tube

is a fundamental principle governing the gravitational interactions of objects throughout the universe.

83. (A) Both A and R are true and R is the correct explanation of A.
A lunar eclipse only occurs when the Sun, Earth, and Moon are perfectly aligned. This does not happen every full moon because the Moon's orbital plane is tilted by approximately five degrees relative to the Earth's orbital plane. Consequently, the Moon usually passes above or below the Earth's shadow, preventing an eclipse from occurring during most of its monthly full moon phases.

84. (C) Law of Conservation of Energy - The total energy of an isolated system remains constant
The Law of Conservation of Energy is a fundamental principle of physics stating that energy cannot be created or destroyed, only transformed from one form to another. In an isolated system, the total amount of energy remains constant over time. This principle is essential for understanding physical processes across all scales, from subatomic particle interactions to the life cycles of stars.

85. (B) Astronomical Unit, Light Year, Parsec
Distances in space are measured using specific units of increasing scale. The Astronomical Unit represents the mean distance between Earth and the Sun. A light-year is the distance light travels in one year, which is significantly larger than an Astronomical Unit. The parsec is the largest of these three units, equivalent to approximately 3.26 light-years, used for measuring vast interstellar distances.

86. (A) Thermodynamics
Thermodynamics is the branch of science that explores the relationships between heat, work, temperature, and energy. These principles are fundamental to astrophysics, as they govern the internal processes of stars, including energy production through nuclear fusion and the transfer of heat from stellar cores to their surfaces. Understanding thermodynamics is essential for modeling the birth, evolution, and death of stars.

87. (A) I and III
Astronomical measurements utilize specialized units to express vast distances. An Astronomical Unit is defined as the mean distance between the Earth and the Sun. A light-year is a unit of distance, not time, representing the journey light takes in one year, approximately 9.46 trillion kilometers. A parsec is another unit of distance that is much larger than an Astronomical Unit.

88. (A) P-II, Q-I, R-IV, S-III
Different types of eclipses occur based on the alignment of the Earth, Moon, and Sun. A total solar eclipse involves the Moon's umbra, while an annular eclipse leaves a ring of light. Lunar eclipses are partial if only some of the Moon enters the umbra, and penumbral if it passes through the outer shadow. These events demonstrate the precise geometric interplay of celestial shadows.

89. (A) 'G' is a universal constant, while 'g' varies with altitude and planetary mass.
In classical physics, the universal gravitational constant, represented by 'G', remains the same throughout the entire universe. In contrast, 'g' represents the acceleration due to gravity, which varies depending on a planet's mass and radius, as well as the altitude above its surface. This distinction is vital for accurately calculating gravitational forces and the motion of objects in different environments.

90. (A) Both A and R are true and R is the correct explanation of A.
Kepler's second law, known as the law of equal areas, explains why a planet's orbital speed varies. When a planet is closer to the Sun at perihelion, it must move faster to sweep out the same area in a given time as it does when it is farther away at aphelion. This variation in speed is a direct consequence of the conservation of angular momentum.

91. (D) The Path of Totality
The path of totality refers to the narrow track on the Earth's surface where the Moon completely obscures the Sun's disk during a solar eclipse. Only observers located within this specific path can experience the total phase of the eclipse and see the solar corona. Those outside this path but still within the Moon's penumbral shadow will only see a partial solar eclipse.

NODIA

92. (A) 3, 2, 1, 4
Scientific understanding of the cosmos has evolved through major formulations over centuries. Copernicus first proposed the heliocentric theory, followed by Kepler's laws of planetary motion. Newton later developed the universal law of gravitation to explain these motions. Finally, Einstein introduced general relativity in the early twentieth century, providing a new framework for understanding gravity and the structure of space and time.

93. (B) Macula - The primary shadow cast by the Earth onto the Sun
Shadows during astronomical events consist of specific regions based on light blockage. The umbra is the darkest central part, the penumbra is the lighter outer part, and the antumbra is the region where an annular eclipse occurs. The term macula refers to a spot or stain, often used in planetary geology, and does not represent a shadow cast during an eclipse event.

94. (C) IV only
Newton's laws of motion and gravitation are fundamental for calculating rocket thrust, understanding orbital mechanics, and managing satellite motion in vacuum conditions. However, these classical laws fail to accurately describe physical phenomena in extremely high gravitational fields, such as those found near black holes. In such environments, Einstein's theory of general relativity is required to provide precise and accurate scientific descriptions of the cosmos.

95. (A) Conservation of Angular Momentum
As a giant interstellar molecular cloud collapses to form a protostar, its radius decreases. To conserve angular momentum, the cloud's rotational speed must increase significantly. This fundamental physical principle explains why protostellar disks and young stars rotate rapidly. It is the same phenomenon observed when a spinning figure skater pulls their arms inward to rotate faster, demonstrating how momentum remains conserved.

96. (C) 6.674×10^{-11} N m^2 kg^{-2}
The Universal Gravitational Constant, represented as 'G', is a fundamental physical constant used to calculate the gravitational force between two masses. Its accepted value is approximately 6.674 multiplied by ten to the power of negative eleven in SI units. This constant is essential for understanding the gravitational interactions that govern the structure and motion of stars, galaxies, and the entire universe.

97. (A) Planets with larger orbits have longer orbital periods
Kepler's third law establishes a precise mathematical relationship between a planet's distance from the Sun and its orbital period. It indicates that planets located further away from the Sun must travel along larger orbital paths and at slower speeds, resulting in significantly longer years. This law applies to all planets and satellites, providing a fundamental rule for orbital dynamics throughout our entire solar system.

98. (D) The Light Year scales appropriately to express vast interstellar and intergalactic units.
While the Astronomical Unit is useful for measuring distances within our solar system, it is too small to practically express the vast gaps between stars and galaxies. The light-year, representing the distance light travels in one year, provides a much larger scale that is appropriate for interstellar and intergalactic measurements. This unit allows astronomers to describe the enormous reaches of the cosmos.

99. (B) An instrument used to detect radio-frequency radiation emitted by space sources.
A radio telescope is a specialized astronomical instrument designed to detect and study radio waves emitted by celestial objects. Unlike optical telescopes that capture visible light, radio telescopes use large parabolic dishes or antenna arrays to collect long-wavelength electromagnetic radiation. These instruments allow astronomers to observe phenomena like pulsars, quasars, and the cosmic microwave background radiation that are invisible to optical eyes.

100. (C) I, II and III
Modern astrophysics relies on multiple space observatories, each specialized for different wavelengths. The Hubble Space Telescope primarily observes visible and ultraviolet light. The James Webb Space Telescope is designed for deep infrared observations to see the early universe. The Chandra X-ray Observatory studies

Click Here to Buy book on Amazon

high-energy phenomena like black holes and supernovae. Together, these instruments provide a comprehensive multi-wavelength view of the vast cosmos.

101. (A) P-I, Q-III, R-II, S-IV
Scientific tools serve diverse purposes in understanding Earth and its history. Carbon dating determines the age of organic remains, while remote sensing utilizes satellite sensors to gather surface data. Ice cores provide a record of historical climates by analyzing trapped air bubbles. The Global Positioning System allows for precise location tracking. Each tool is essential for research in archeology, environmental science, and navigation.

102. (A) Galileo Galilei
Galileo Galilei was a pioneering astronomer who was the first to systematically use a telescope for celestial observations. In the early seventeenth century, he discovered the four largest moons of Jupiter, the phases of Venus, and sunspots on the solar disk. His discoveries provided critical observational evidence that challenged the geocentric model and supported the heliocentric theory of the solar system.

103. (A) Both A and R are true and R is the correct explanation of A.
Remote sensing satellites are essential tools for modern agriculture, providing multispectral imagery that helps monitor crop health and environmental conditions. By analyzing data on soil moisture and vegetation indices, scientists and farmers can predict yields and manage resources more effectively. This technology is particularly valuable for optimizing agricultural productivity and ensuring food security in regions like Tamil Nadu through precise monitoring.

104. (B) Solar Observatory - Nainital, Uttarakhand
India hosts several world-class astronomical facilities. The Vainu Bappu Observatory is in Kavalur, and the GMRT is near Pune. The Indian Astronomical Observatory is located in Hanle. While there is a Solar Observatory in Udaipur, the Aryabhatta Research Institute of Observational Sciences in Nainital is a general astrophysics center rather than a dedicated solar observatory. Thus, that specific pairing is incorrect.

105. (A) Refracting telescope, Reflecting telescope, Catadioptric telescope, Space-based optical telescope
The history of optical telescopes began with the invention of the refracting telescope using lenses. Isaac Newton later developed the reflecting telescope using mirrors to reduce chromatic aberration. Catadioptric telescopes, combining lenses and mirrors, were developed in the twentieth century. Finally, the launch of space-based telescopes allowed astronomers to observe the universe clearly without the distortion caused by the Earth's thick atmosphere.

106. (C) 5,730 years
Radiocarbon dating relies on the decay of the Carbon-14 isotope, which has a known half-life of approximately 5,730 years. This relatively short half-life makes it an ideal tool for determining the age of organic materials from the last fifty thousand years. By measuring the remaining Carbon-14 in a sample, scientists can accurately estimate when an organism died, aiding historical research.

107. (C) III only
Climate models utilize sophisticated mathematical algorithms and high-performance supercomputers to simulate complex environmental processes. These models incorporate historical data from sources like ice cores to ensure accuracy. While they are essential for understanding long-term climate trends and global changes, they cannot perfectly predict local weather conditions decades in advance due to the inherent chaotic nature of the Earth's atmospheric systems.

108. (A) P-IV, Q-II, R-I, S-III
Astronomers use different telescopes to observe various celestial phenomena. Optical telescopes map planetary surfaces, while radio telescopes detect the cosmic microwave background and pulsars. X-ray telescopes are best for studying high-energy regions like black hole accretion disks. Infrared telescopes can see through dust clouds to observe star-forming regions. Using these instruments together allows for a more complete understanding of the universe's structure.

NODIA

109. (B) They contain trapped air bubbles that reveal historical atmospheric composition.
Ice cores are valuable tools for paleoclimatology because they contain ancient air bubbles trapped within the ice layers. By analyzing these bubbles, scientists can reconstruct the historical composition of the Earth's atmosphere, including past levels of greenhouse gases like carbon dioxide and methane. This information provides a detailed record of the planet's climate history over hundreds of thousands of years.

110. (A) Both A and R are true and R is the correct explanation of A.
Space-based telescopes offer a significant advantage over ground-based observatories because they operate above the Earth's atmosphere. The atmosphere absorbs, scatters, and distorts many wavelengths of light, particularly ultraviolet, X-rays, and parts of the infrared spectrum. By placing telescopes in orbit, astronomers can capture much clearer images and data across the entire electromagnetic spectrum, despite the higher operational costs involved.

111. (A) It requires signals from only one satellite to determine a precise 3D location on Earth
The Global Positioning System operates using a network of satellites in medium Earth orbit. A receiver determines its location by analyzing time delays from multiple satellite signals. To provide an accurate three-dimensional position, including latitude, longitude, and altitude, signals from at least four satellites are required. Using only one satellite is insufficient to calculate a precise location on the Earth's surface.

112. (A) 4, 2, 1, 3
Earth's geological history is divided into major eras based on fossil records and significant biological events. The Precambrian is the oldest and longest era, followed by the Paleozoic, which saw the rise of complex life. The Mesozoic is known as the age of reptiles, and the Cenozoic is the current era. This chronological sequence is essential for studying evolution.

113. (A) RISAT - Radar imaging satellite for agriculture and disaster management.
India's satellite programs serve various practical purposes. The Radar Imaging Satellite, or RISAT, uses radar sensors to provide all-weather monitoring for agriculture and disaster management. In contrast, INSAT is primarily for communication and meteorology, while AstroSat is a dedicated astronomical observatory. Identifying these specific functions is crucial for understanding how space technology is applied to meet diverse national and scientific needs.

114. (C) III only
The James Webb Space Telescope is a premier infrared observatory equipped with a large gold-coated mirror. It is designed to observe distant galaxies and study the early universe. Unlike the Hubble Space Telescope, which orbits the Earth, the James Webb Space Telescope is positioned at the second Lagrange point, roughly 1.5 million kilometers away. It does not orbit in low Earth orbit.

115. (B) Radiocarbon dating of Harappan artifacts
Predictive science focuses on using current data and advanced models to forecast future events, such as disease spread, weather patterns, or temperature changes. Radiocarbon dating, however, is an analytical technique used to determine the age of organic materials from the past. Since it focuses on historical data rather than future predictions, it is not classified as a domain of predictive science.

116. (C) They offer empirical evidence for biological evolution and mass extinctions.
Fossil records are vital to the scientific understanding of life's history on Earth. They provide direct empirical evidence of how species have changed over geological time and document major events such as mass extinctions. By studying fossils, scientists can reconstruct ancient ecosystems and trace the evolutionary lineages of modern organisms, offering a detailed record of the planet's diverse biological past.

117. (D) Measuring frequency shifts of radar waves reflected by moving precipitation.
Doppler Weather Radar is a critical tool for meteorology that uses the Doppler effect to track weather patterns. By measuring the frequency shift of radar waves reflected off raindrops or other precipitation, the system can determine the speed and direction of moving storms. This capability allows meteorologists to provide early

Downloaded from www.pdf.tube

warnings for severe weather events like cyclones and heavy rainfall.

118. (A) It generates its own energy source to illuminate the target (e.g., Radar)
Remote sensing is categorized as active or passive based on the energy source used. Active remote sensing systems, such as radar and lidar, generate their own electromagnetic energy to illuminate a target and measure the reflected signal. This allows them to operate independently of sunlight, making them effective for gathering data during the night or through cloud cover, unlike passive sensors.

119. (B) Dark Matter holds galaxies together, while Dark Energy drives cosmic expansion.
Dark matter and dark energy are two mysterious components that dominate the universe's mass-energy content. Dark matter exerts a gravitational pull that helps hold galaxies together and explains their rotation speeds. In contrast, dark energy acts as a repulsive force that is responsible for the observed accelerating expansion of the universe. Together, they shape the large-scale structure and ultimate fate of the cosmos.

120. (A) I and II
The existence of dark matter is supported by several key astronomical observations. These include the unexpectedly flat rotation curves of spiral galaxies and the observed gravitational lensing of light from distant galaxies by massive clusters. While the accelerating expansion of the universe is a major cosmological discovery, it is attributed to the influence of dark energy rather than dark matter itself.

121. (A) P-IV, Q-III, R-II, S-I
Ancient Indian astronomy was led by brilliant scholars who made significant contributions to the field. Aryabhata wrote the Aryabhatiya, and Varahamihira authored the Panchasiddhantika. Brahmagupta formulated rules for computing with zero in the Brahmasphutasiddhanta, while Bhaskaracharya wrote the Siddhanta Shiromani. These works laid the foundation for mathematics and astronomy, influencing scientific thought for centuries in India and beyond its borders.

122. (C) The Multiverse Theory
The multiverse theory is a scientific hypothesis suggesting that our observable universe is just one of many distinct, potentially infinite universes. Each of these universes may have different physical laws, constants, and dimensions. This concept arises from certain interpretations of quantum mechanics and inflationary cosmology, providing a framework for discussing the vastness and possible variety of the entire cosmic structure.

123. (A) Both A and R are true and R is the correct explanation of A.
Observations of distant supernovae have revealed that the expansion of the universe is not slowing down, but is actually accelerating. This acceleration is attributed to dark energy, a mysterious form of energy that permeates all of space and exerts a repulsive gravitational pressure. Dark energy currently overcomes the attractive force of matter, driving galaxies apart at an ever-increasing rate.

NODIA

124. (C) Mumbai - Primarily designed for naval astronomical navigation
Maharaja Jai Singh II constructed five Jantar Mantar observatories in Jaipur, Delhi, Ujjain, Varanasi, and Mathura. These sites feature sophisticated stone instruments for measuring time and tracking celestial bodies. The Jaipur observatory contains the world's largest stone sundial. There is no historical Jantar Mantar observatory located in Mumbai, making the statement regarding its use for naval navigation geographically and historically incorrect.

125. (B) Aryabhata, Varahamihira, Brahmagupta, Bhaskaracharya
Ancient Indian astronomical thought developed through the contributions of several key figures across different centuries. Aryabhata flourished in the late fifth and early sixth centuries, followed by Varahamihira later in the sixth century. Brahmagupta lived in the seventh century, while Bhaskaracharya represents the later peak of classical Indian mathematics and astronomy in the twelfth century. This sequence correctly reflects their historical order.

126. (D) Detecting exoplanets orbiting distant stars
The transit method and the radial velocity method are the two most successful scientific techniques used to discover exoplanets. The transit method detects a planet when it passes in front of its star, causing a slight dimming. The radial velocity method measures the tiny wobbles in a star's motion caused by a planet's gravity. These tools have identified thousands of worlds.

127. (C) I, III and IV
The search for extraterrestrial intelligence utilizes radio telescopes to scan for signals, guided by the Drake Equation's probability estimates. Missions like Perseverance search for ancient microbial signs on Mars. While liquid water is a vital biosignature, its discovery does not definitively prove that life currently exists on the planet. These ongoing scientific efforts aim to answer fundamental questions about life's cosmic prevalence.

128. (A) P-II, Q-I, R-IV, S-III
Mars exploration has become a global endeavor with missions from several space agencies. India's Mangalyaan was managed by ISRO, while the Perseverance rover was launched by NASA. The Hope Probe represents the United Arab Emirates' space agency, and the Tianwen-1 mission was conducted by China's CNSA. These diverse missions contribute to a shared international understanding of the Red Planet's history and environment.

129. (A) The Drake Equation
The Drake Equation is a probabilistic framework used to estimate the number of active, communicative extraterrestrial civilizations in the Milky Way galaxy. It combines various factors, including the rate of star formation, the fraction of stars with planets, and the likelihood of life developing intelligence and technology. While many variables remain uncertain, the equation serves as a vital tool for astrobiological discussions.

130. (C) A is true but R is false.
Aryabhata was a pioneering ancient Indian astronomer who proposed that the Earth rotates on its own axis, explaining the apparent motion of stars. He also provided correct scientific explanations for solar and lunar eclipses. While some contemporary models were geocentric, Aryabhata's insights into Earth's rotation demonstrate that ancient Indian astronomy was sophisticated and not limited to a static, unmoving Earth view.

131. (B) An exoplanet is passing in front of the star and blocking some of its light.
The transit method is a primary technique used by astronomers to detect exoplanets. When a planet orbits a star and passes directly between the star and an observer, it blocks a small fraction of the star's light. This results in a regular, periodic dimming in the star's observed brightness, providing clear evidence of the planet's presence, size, and orbital period.

132. (A) 3, 1, 2, 4
A typical Mars surface mission follows a precise sequence of operational stages. It begins with the launch from Earth, followed by a long cruise phase through interplanetary space. The most critical stage is the entry, descent, and landing, often referred to as the seven minutes of terror. Once safely on the surface, the mission commences its scientific data collection and operations.

133. (D) Samrat Yantra - A massive sundial used to measure local time accurately.
The Jantar Mantar observatories feature several specialized astronomical instruments. The Samrat Yantra is a massive stone sundial designed to measure local time with high precision by tracking the Sun's shadow. Other instruments include the Ram Yantra for altitude and azimuth, and the Jai Prakash Yantra for mapping celestial coordinates. These sophisticated structures represent the advanced state of observational astronomy in India.

134. (B) I, II and V
Aryabhata significantly contributed to mathematics and astronomy through his work, the Aryabhatiya. He accurately calculated the sidereal year and explained that eclipses result from shadows. He also noted that planets shine by reflecting sunlight. While he used zero in his place-value system, the formal rules for computing with zero as a number are generally attributed to the later mathematician Brahmagupta.

Click Here to Buy book on Amazon

135. (B) It helps humanity understand its place in the cosmos and unify perspectives.
The scientific search for extraterrestrial life offers profound philosophical benefits beyond potential technological gains. By exploring whether life exists elsewhere, humanity can better understand its own origins and its unique or common place within the vast universe. This cosmic perspective encourages a more unified view of humanity and fosters a sense of stewardship for our planet as a fragile home.

136. (B) Invisible matter that does not emit light but exerts gravitational force.
Dark matter is a mysterious form of matter that makes up about twenty-seven percent of the universe. It is invisible because it does not emit, absorb, or reflect any electromagnetic radiation, including light. Its existence is inferred solely through its gravitational effects on visible matter, such as the rotation of galaxies and the bending of light from distant objects through gravitational lensing.

137. (A) Aryabhata
India entered the space age in 1975 with the launch of its first satellite, named Aryabhata. It was named after the legendary fifth-century Indian astronomer and mathematician whose pioneering work laid the foundation for Indian science. The satellite was designed to conduct experiments in X-ray astronomy and solar physics, marking a significant milestone in India's journey toward becoming a major space power.

138. (C) Varahamihira
Varahamihira was a renowned sixth-century Indian astronomer and mathematician who authored the Panchasiddhantika. This significant work provides a comprehensive summary of five older astronomical treatises, some of which are now lost. His contributions helped preserve and synthesize ancient astronomical knowledge, serving as a bridge between early Indian science and the later classical period of scholars like Brahmagupta and Bhaskaracharya.

139. (D) It is India's first dedicated multi-wavelength space observatory
AstroSat is a landmark mission launched by ISRO as India's first dedicated multi-wavelength space observatory. It is equipped with five scientific payloads designed to observe the universe simultaneously across the visible, ultraviolet, and X-ray regions of the electromagnetic spectrum. This unique capability allows astronomers to study high-energy processes in celestial objects with unprecedented detail from a single satellite platform in orbit.

140. (B) I and III
The Giant Metrewave Radio Telescope is a major international facility located near Pune, India. It consists of an array of thirty steerable parabolic dishes used to study radio waves from celestial sources. Operated by the National Centre for Radio Astrophysics, it is one of the world's most sensitive radio telescopes at low frequencies, aiding research on pulsars, galaxies, and cosmology.

141. (A) P-II, Q-I, R-III, S-IV
India has several premier institutions dedicated to space science and astronomy. IUCAA is located in Pune, while the Indian Institute of Astrophysics is headquartered in Bengaluru. The Physical Research Laboratory and the Space Applications Centre are both based in Ahmedabad. These centers collaborate on research and mission development, playing a critical role in advancing India's scientific capabilities and contribution to global knowledge.

142. (D) Astrology is universally recognized as a rigorous sub-discipline of modern astrophysics
Astronomy is a natural science that utilizes the scientific method, mathematics, and empirical observations to study celestial objects and the universe. In contrast, astrology is a pseudoscience that suggests celestial positions influence human lives and destinies. Unlike astronomy, astrology lacks empirical evidence, testable mechanisms, and scientific recognition. It is not considered a valid or rigorous sub-discipline within the field of astrophysics.

143. (A) Both A and R are true and R is the correct explanation of A.
Astronomy is a robust scientific discipline because its theories and hypotheses are grounded in empirical evidence and the scientific method. Concepts like the Big Bang or planetary motion are subject to falsifiability and are constantly

Downloaded from www.pdf.tube

tested through rigorous observational data. This commitment to objective verification and the revision of ideas based on new evidence distinguishes astronomy as a foundational branch of science.

144. (C) Himalayan Chandra Telescope - Mount Abu, Rajasthan
India operates several advanced telescopes for astronomical research. The Vainu Bappu Telescope is situated in Kavalur, and the Ooty Radio Telescope is in Udhagamandalam. The Devasthal Optical Telescope is located near Nainital. However, the Himalayan Chandra Telescope is located at the Indian Astronomical Observatory in Hanle, Ladakh, rather than Mount Abu in Rajasthan. Therefore, the pairing for that telescope is incorrect.

145. (A) Chandrayaan-1, Mangalyaan, AstroSat, Aditya-L1
India's major space missions have been launched in a specific chronological order reflecting ISRO's expanding capabilities. Chandrayaan-1, the first lunar mission, was launched in 2008. The Mars Orbiter Mission, Mangalyaan, followed in 2013. AstroSat, the dedicated space observatory, was launched in 2015. Most recently, Aditya-L1, the first mission to study the Sun from a Lagrange point, was launched in late 2023.

146. (D) Rigorous peer review and willingness to revise theories based on new data.
Pseudosciences, such as astrology, often rely on anecdotal evidence and resist change even when contradicted by new data. They generally lack testable physical mechanisms. In contrast, rigorous peer review and the constant revision of theories based on fresh observational evidence are defining hallmarks of legitimate scientific disciplines like astronomy. These processes ensure that scientific knowledge remains accurate, reliable, and objectively verified.

147. (A) I, II and III
The scientific study of the universe has led to major philosophical shifts in our worldview. The transition from a geocentric to a heliocentric model, known as the Copernican principle, demonstrated that Earth does not occupy a privileged central position. Furthermore, discovering the vast scale of space and cosmic time has provided a deeper understanding of humanity's relatively brief yet significant presence.

148. (A) P-II, Q-I, R-IV, S-III
The Aditya-L1 mission carries several specialized payloads to study different aspects of the Sun. The VELC images the solar corona and mass ejections, while SUIT focuses on the photosphere and chromosphere in ultraviolet. ASPEX analyzes solar wind particles, and the Magnetometer measures interplanetary magnetic fields. These instruments together provide a comprehensive view of solar dynamics and their impact on space weather.

149. (D) Space technologies result in spin-offs that benefit everyday life on Earth.
Studying the universe is vital for technological progress because the extreme challenges of space exploration drive innovation. Many technologies originally developed for space missions, such as advanced imaging sensors, water purification systems, and durable materials, are later adapted for commercial use on Earth. These technological spin-offs enhance daily life, improve medical treatments, and contribute significantly to global economic and scientific development.

150. (A) Both A and R are true and R is the correct explanation of A.
The Kodaikanal Solar Observatory has been a vital center for solar physics since its establishment. Its most famous contribution was the discovery of the Evershed effect in 1909, which describes the radial flow of gas in sunspots. This discovery was a major milestone in solar astronomy, and the observatory continues to provide important data on solar activity and its environmental effects.

151. (B) Processing degraded images of distant galaxies and stars
Many modern medical imaging technologies, including MRI enhancements and digital mammography, utilize digital image processing algorithms originally developed for astronomy. These techniques were created to enhance and clarify faint, degraded images of distant stars and galaxies captured by telescopes. The adaptation of this software for healthcare demonstrates how space-based research provides significant, life-saving technological benefits for people on Earth.

NODIA

152. (A) 3, 1, 4, 2
The electromagnetic spectrum is organized by wavelength and frequency. Radio waves have the lowest frequency and longest wavelength, followed by visible light and then ultraviolet radiation. X-rays have much higher frequencies and shorter wavelengths. Arranging these regions correctly is fundamental for missions like AstroSat, which observe across multiple wavelengths to provide a detailed and comprehensive scientific understanding of various celestial objects.

153. (A) Kodaikanal Observatory - Operated by the Indian Institute of Astrophysics (IIA)
Tamil Nadu has a rich history of contributing to Indian astronomy and space science. The Kodaikanal Solar Observatory, operated by the Indian Institute of Astrophysics, is a premier site for solar research. The Vainu Bappu Observatory is in Kavalur, and the Mahendragiri facility focuses on liquid propulsion systems. These institutions play critical roles in both ground-based observational astronomy and the development of spaceflight technology.

154. (B) I, II, III, IV and V
India's space program features a diverse range of missions designed for astronomical observation and exploration. Aditya-L1 studies the Sun, AstroSat focuses on multi-wavelength astronomy, and XPoSat analyzes X-ray polarization. Chandrayaan-3 achieved a historic lunar landing, while the Gaganyaan mission aims to send humans into space. Together, these missions demonstrate India's comprehensive and growing capabilities across all major domains of space science.

155. (D) Radio Astronomy
Radio astronomy involves observing celestial objects that emit radio waves and microwaves. The Cosmic Microwave Background radiation is the faint afterglow of the Big Bang, appearing as a nearly uniform glow across the entire sky. Because this radiation is detected in the microwave part of the electromagnetic spectrum, its study is fundamentally categorized as a specialized area within the field of radio astronomy.

156. (C) Ptolemaic is geocentric, whereas the Copernican model is heliocentric.
The shift from the Ptolemaic model to the Copernican model represents a fundamental change in astronomical thought. The Ptolemaic system was geocentric, placing the Earth at the center of the universe with all other bodies orbiting it. In contrast, Nicolaus Copernicus proposed a heliocentric model, positioning the Sun at the center. This revolutionary change provided a simpler and more accurate framework for planetary motion.

157. (B) It promotes research and teaching in astronomy across Indian universities.
The Inter-University Centre for Astronomy and Astrophysics, based in Pune, serves as a vital hub for scientific academic development in India. Its primary role is to promote and coordinate research, as well as facilitate the teaching of astronomy and astrophysics within the Indian university system. By providing access to advanced facilities and expertise, it helps train the next generation of Indian scientists.

158. (D) The development of memory foam originally created for NASA aircraft seating.
Space technologies often lead to spin-offs that benefit society in various ways. A prominent example is the development of memory foam, which NASA originally created to improve crash protection and comfort for aircraft seats. This material was later adapted for use in commercial products such as mattresses and pillows, demonstrating the practical impact of space research on everyday life and consumer technology.

159. (D) I, II and III
Statement I is correct because exoplanets are planets that orbit stars other than the Sun. Statement II is also correct, as the transit method identifies exoplanets by detecting periodic dips in a star's brightness when a planet passes in front of it. Statement III is correct because all confirmed exoplanets discovered so far are located within our Milky Way Galaxy. Therefore, all three statements are correct, making option (D) the right answer.

Click Here to Buy book on Amazon

160. (A) Both A and R are true and R is the correct explanation of A.
The Assertion is true because space telescopes generally provide clearer and more detailed observations of celestial objects than ground-based telescopes. The Reason is also true since space telescopes operate above Earth's atmosphere, eliminating atmospheric turbulence, cloud cover, and absorption of certain wavelengths of electromagnetic radiation. This allows them to capture sharper images and detect signals that cannot reach the Earth's surface. Therefore, the Reason correctly explains the Assertion.

www.nodia.in

NODIA

CHAPTER 03

Mechanics and Properties of Matter

1. Consider the following statements regarding the states of matter:

I. Plasma consists of super-energetic and super-excited particles in the form of ionized gases.

II. Bose-Einstein Condensate is formed by heating a gas of extremely low density to super-high temperatures.

III. In solids, the intermolecular spaces are minimal, rendering them highly incompressible.

Which of the above statements is/are correct?

(A) I and II only
(B) I and III only
(C) II only
(D) III only
(E) Answer not known

2. The amount of heat energy required to change 1 kg of a solid into a liquid at atmospheric pressure at its melting point is defined as:

(A) Specific heat capacity
(B) Latent heat of fusion
(C) Latent heat of vaporization
(D) Heat capacity
(E) Answer not known

3. Match the following physical quantities (List I) with their SI units (List II):

List I: (Physical quantities)

P. Density
Q. Weight
R. Pressure
S. Mass

List II: (SI units)

I. Newton
II. Kilogram
III. Kilogram per cubic metre
IV. Pascal

Which of the following correctly matches List I with List II?

(A) P-III, Q-I, R-IV, S-II
(B) P-III, Q-II, R-IV, S-I
(C) P-IV, Q-I, R-III, S-II
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

4. In Tamil Nadu, traditional potters use a heavy spinning wheel. The inertia of the wheel helps it to keep spinning once set in motion. This demonstrates an application of which concept?

(A) Newton's first law of motion
(B) Newton's second law of motion
(C) Bernoulli's principle
(D) Pascal's law
(E) Answer not known

5. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.

Assertion (A): Water boils at a lower temperature in the hill station of Kodaikanal compared to Chennai.

Reason (R): Atmospheric pressure decreases with an increase in altitude.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

6. Identify the correct statement regarding density and relative density.

(A) Ratio of a substance's density to water's density at 4 degrees Celsius.
(B) Unit of measurement defined as kg/m^3 for density comparison in standard fluids.
(C) Minimum density point of water occurring at exactly 4 degrees Celsius for all states.
(D) Buoyancy of iron on mercury due to the density of mercury being lower than iron.
(E) Answer not known

Downloaded from www.pdf.tube

7. Which of the following pairs concerning the changes of state is correctly matched?
(A) Sublimation - Liquid changing into gas
(B) Freezing - Solid changing into liquid
(C) Evaporation - Solid changing into gas
(D) Condensation - Gas changing into liquid
(E) Answer not known

8. Identify the incorrect statement among the following.
(A) Mass is a scalar quantity while weight is a vector quantity.
(B) A spring balance is generally used to measure the mass of a body.
(C) The mass of a body remains constant everywhere in the universe.
(D) The weight of a body is zero at the centre of the Earth.
(E) Answer not known

9. Consider the following statements regarding Archimedes' Principle and Buoyancy:
I. When a body is fully or partially immersed in a fluid, it experiences an upward force.
II. The upward buoyant force is equal to the weight of the fluid displaced by the body.
III. A body floats if its density is greater than the density of the fluid.
IV. The centre of buoyancy is the centre of gravity of the displaced fluid.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) I, II and III only
(C) II and IV only
(D) I and III only
(E) Answer not known

10. During the local bull-taming sport Jallikattu, a player applies force to bring a running bull to rest over a certain time interval. The product of this average force and the time interval is known as:
(A) Torque
(B) Work done
(C) Power
(D) Impulse
(E) Answer not known

11. Arrange the following stages of matter generally based on increasing intermolecular forces of attraction:
I. Solid
II. Gas
III. Liquid
Which of the following represents the correct sequence?
(A) I, III, II
(B) II, III, I
(C) III, II, I
(D) II, I, III
(E) Answer not known

12. Which of the following is a key feature of an anemic condition physically modelled by viscosity in fluid mechanics?
(A) Highly viscous blood slowing down the cardiovascular system
(B) Resistance to flow caused by internal friction of the fluid layers
(C) The dependence of blood viscosity strictly on the length of blood vessels
(D) Surface tension driving the bulk blood flow in major arteries
(E) Answer not known

NODIA

13. Match the following machines (List I) with their respective classes of levers (List II):
List I: (Machines)
P. See-saw
Q. Wheelbarrow
R. Fishing rod
S. Pliers
List II: (Classes of levers)
I. Class II lever
II. Class III lever
III. Class I lever
IV. Class I lever
Which of the following correctly matches List I with List II?
(A) P-III, Q-I, R-II, S-III
(B) P-III, Q-II, R-I, S-III
(C) P-I, Q-III, R-II, S-I
(D) P-II, Q-I, R-III, S-II
(E) Answer not known

14. What is the primary advantage of placing the handle of a hand water pump far from the fulcrum?
(A) It increases the mechanical advantage, requiring less effort.
(B) It decreases the velocity ratio, speeding up the water flow.

(C) It eliminates the need for atmospheric pressure in pumping.
(D) It increases the effort required but delivers more power.
(E) Answer not known

15. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A ship made of iron and steel floats on seawater, whereas a small iron nail sinks.
Reason (R): The ship encloses a large volume of air, making its average density less than that of seawater.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

16. The SI unit of the coefficient of viscosity is:
(A) $N\ m^{-2}$
(B) $N\ s^{-1}\ m$
(C) $N\ s\ m^{-1}$
(D) $N\ s\ m^{-2}$
(E) Answer not known

17. Which of the following pairs is incorrectly matched regarding units of physical quantities?
(A) Work - Joule
(B) Power - Watt
(C) Force - Pascal
(D) Frequency - Hertz
(E) Answer not known

18. Consider the following statements about Pressure and Pascal's Law:
I. Pressure is a scalar quantity.
II. Pascal's Law states that pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid.
III. Hydraulic brakes in vehicles operate on the principle of Pascal's Law.
IV. Atmospheric pressure is measured using an anemometer.
V. At sea level, standard atmospheric pressure is approximately 101,325 Pascals.
Which of the above statement(s) is/are correct?
(A) I, II, III and V only
(B) I, II, III and IV only
(C) II, III and V only
(D) I, IV and V only
(E) Answer not known

19. Arrange the following planets/celestial bodies in increasing order of their acceleration due to gravity (g) on the surface (lowest to highest):
I. Earth
II. Moon
III. Jupiter
Select the correct sequence:
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) II, III, I
(E) Answer not known

20. Which of the following is the most appropriate description of 'Centripetal Force'?
(A) A force acting on a body in a circular path directed towards the centre.
(B) A pseudo force that acts directed outwards from the centre of rotating frames.
(C) A force that acts tangentially to the circular path to increase rotational speed.
(D) An independent force that cancels out the gravitational pull on orbiting objects.
(E) Answer not known

21. Consider the following statements regarding kinematics:
I. Distance is a scalar quantity and displacement is a vector quantity.
II. Speed is the rate of change of displacement.
III. Velocity can be negative, but speed is always positive or zero.
Which of the above statement(s) is/are incorrect?
(A) I and II only
(B) I and III only
(C) II only
(D) III only
(E) Answer not known

22. The term "Acceleration" is defined as:
(A) The rate of change of velocity of an object with respect to time.
(B) The total distance covered in a specific time.
(C) The rate of change of position of an object

Click Here to Buy book on Amazon

in a specific direction.
(D) The product of mass and velocity of a moving object.
(E) Answer not known

23. Match the type of friction (List I) with its characteristic (List II):
List I: (Type of friction)
P. Static friction
Q. Kinetic friction
R. Rolling friction
S. Fluid friction
List II: (Characteristic)
I. Present when a body is in steady motion over a surface
II. Opposes the initiation of motion
III. Drag experienced by a body moving through water
IV. Experienced by a wheel moving over a road
Which of the following correctly matches List I with List II?
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

24. While travelling in the Nilgiri Mountain Railway, passengers are pushed backward when the train accelerates suddenly. This is an application of:
(A) Inertia of motion
(B) Inertia of rest
(C) Inertia of direction
(D) Centrifugal force
(E) Answer not known

25. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): It is easier to pull a lawnmower than to push it.
Reason (R): Pulling decreases the effective weight of the lawnmower, thus reducing the normal reaction and the force of friction.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

26. Identify the correct statement about Newton's third law of motion.
(A) Action and reaction act on the same body and cancel each other out.
(B) The law only applies when bodies are in contact with each other.
(C) It explains the concept of inertia and mass.
(D) Action and reaction act on different bodies and are equal and opposite.
(E) Answer not known

NODIA

27. Which of the following pairs is correctly matched regarding energy types?
(A) Water stored in a dam - Potential energy
(B) A stretched bow - Kinetic energy
(C) A flying bird - Only potential energy
(D) A moving car - Chemical energy
(E) Answer not known

28. Identify the incorrect statement concerning gravitation.
(A) The universal gravitational constant (G) has the same value everywhere in the universe.
(B) Acceleration due to gravity (g) increases as we go higher above the Earth's surface.
(C) The acceleration due to gravity (g) is zero at the centre of the Earth.
(D) The value of g is slightly greater at the poles than at the equator.
(E) Answer not known

29. Consider the following statements about Work and Energy:
I. Work done is zero if the displacement is perpendicular to the applied force.
II. The work-energy theorem states that the work done by a net force equals the change in potential energy.
III. Power is the rate at which work is done.
IV. 1 Horsepower (HP) is exactly equal to 1000 Watts.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I and III only
(C) II, III and IV only
(D) I and IV only
(E) Answer not known

30. Which of the following is a scalar quantity?

(A) Distance
(B) Displacement
(C) Velocity
(D) Acceleration
(E) Answer not known

31. Arrange the following steps to show the correct sequence for calculating the mechanical advantage (MA) of a simple machine:
I. Identify the effort applied to the machine.
II. Measure the load lifted by the machine.
III. Calculate the ratio of Load to Effort.
Which of the following represents the correct sequence?
(A) II, I, III
(B) I, II, III
(C) III, I, II
(D) II, III, I
(E) Answer not known

32. An object is dropped from rest from the top of the Pamban Bridge. Ignoring air resistance, the distance it falls is directly proportional to the:
(A) Mass of the object
(B) Time elapsed
(C) Volume of the object
(D) Square of the time elapsed
(E) Answer not known

33. Match the examples (List I) with the associated principles (List II):
List I: (Examples)
P. Raindrops acquiring spherical shape
Q. Hydraulic lift
R. Aircraft wing producing lift
S. Recoil of a gun
List II: (Principles)
I. Newton's Third Law
II. Bernoulli's Principle
III. Pascal's Law
IV. Surface Tension
Which of the following correctly matches List I with List II?
(A) P-IV, Q-III, R-II, S-I
(B) P-IV, Q-II, R-III, S-I
(C) P-III, Q-IV, R-I, S-II
(D) P-I, Q-III, R-II, S-IV
(E) Answer not known

34. The maximum distance a projectile covers horizontally before hitting the ground is called its range. For a given velocity, the range is maximum when the angle of projection is:
(A) 30 degrees
(B) 45 degrees
(C) 60 degrees
(D) 90 degrees
(E) Answer not known

35. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): When a bus takes a sharp turn, passengers tend to fall outward.
Reason (R): A centrifugal force pushes them radially outward due to the inertia of direction.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

36. Hooke's law in elasticity is valid only:
(A) Within the elastic limit
(B) For fluids in motion
(C) Beyond the yield point
(D) For plastic materials only
(E) Answer not known

37. Which of the following pairs is incorrectly matched regarding simple machines?
(A) Inclined plane - Ramps in hospitals
(B) Wedge - An axe blade
(C) Pulley - A crowbar
(D) Wheel and axle - Steering wheel
(E) Answer not known

38. Consider the following statements regarding the Centre of Mass and Centre of Gravity:
I. The centre of mass of a uniform rod lies at its geometric centre.
II. The centre of gravity is the point through which the entire weight of the body acts.
III. For small objects on Earth, the centre of mass and centre of gravity coincide.
IV. A lower centre of gravity decreases the stability of an object.
V. The Leaning Tower of Pisa remains stable because the vertical line from its centre of

gravity falls outside its base.

Which of the above statement(s) is/are correct?

(A) I, II, III and V only
(B) I, II and III only
(C) II, III, IV and V only
(D) I, IV and V only
(E) Answer not known

39. Arrange the following fluids in increasing order of their typical viscosity at room temperature:

I. Water
II. Honey
III. Air

Which of the following represents the correct sequence?

(A) III, I, II
(B) I, III, II
(C) II, I, III
(D) III, II, I
(E) Answer not known

40. According to the Work-Energy Theorem, the net work done on a body is equal to the change in its:

(A) Momentum
(B) Kinetic energy
(C) Potential energy
(D) Acceleration
(E) Answer not known

41. Consider the following statements regarding elasticity:

I. Stress is the restoring force per unit area set up inside the body.
II. Strain has no unit and no dimensions.
III. Steel is less elastic than rubber.

Which of the above statement(s) is/are correct?

(A) I and II only
(B) II and III only
(C) I only
(D) III only
(E) Answer not known

42. The property of a liquid surface to shrink into the minimum surface area possible is called:

(A) Viscosity
(B) Capillarity
(C) Elasticity
(D) Surface tension
(E) Answer not known

43. Match the physical quantities (List I) with their dimensional formulae (List II):

List I: (Physical quantities)

P. Force
Q. Work
R. Pressure
S. Acceleration

List II: (Dimensional formulae)

I. ML^2T^{-2}
II. MLT^{-2}
III. LT^{-2}
IV. $ML^{-1}T^{-2}$

Which of the following correctly matches List I with List II?

(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-II, S-IV
(E) Answer not known

44. In the traditional Tamil sport of Silambam, a practitioner spins a staff rapidly. Which force provides the inward pull necessary to keep the ends of the staff moving in a circular path?

(A) Centrifugal force
(B) Centripetal force
(C) Frictional force
(D) Gravitational force
(E) Answer not known

45. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.

Assertion (A): An iron block sinks in water, but a wooden block of the same mass floats.

Reason (R): The density of iron is greater than the density of water, whereas the density of wood is less than the density of water.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

46. Which of the following statements about momentum is correct?

(A) Momentum is the product of mass and velocity.

Downloaded from www.pdf.tube

(B) Momentum is a scalar quantity.
(C) Momentum is conserved only in elastic collisions, not in inelastic collisions.
(D) An object at rest can have non-zero momentum.
(E) Answer not known

47. Which of the following pairs concerning the laws of motion is correctly matched?
(A) First Law - Law of Interaction
(B) Third Law - Law of Inertia
(C) Second Law - F = ma
(D) Law of Conservation of Momentum - Archimedes Principle
(E) Answer not known

48. Identify the incorrect statement regarding the simple pendulum.
(A) The time period of a simple pendulum depends on its length.
(B) The time period depends on the acceleration due to gravity.
(C) At the extreme positions, its kinetic energy is zero.
(D) The time period depends heavily on the mass of the bob.
(E) Answer not known

49. Consider the following statements about projectile motion:
I. The horizontal velocity of a projectile remains constant if air resistance is neglected.
II. The vertical velocity changes uniformly due to gravity.
III. The path of a projectile is a hyperbola.
IV. At the highest point of the trajectory, the vertical velocity is zero.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) I, II and III only
(C) II and IV only
(D) I and III only
(E) Answer not known

50. Select the correct sequence of events when a liquid is heated to its boiling point:
I. Temperature rises and molecules gain kinetic energy.
II. Intermolecular bonds are broken completely.
III. The liquid changes state into a gas.
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) I, III, II
(E) Answer not known

51. The atmospheric pressure at the summit of the Doddabetta peak in the Nilgiris is lower than at Chennai. What is the most relevant consequence of this?
(A) Water boils at a higher temperature at Doddabetta.
(B) The density of water is halved at Doddabetta.
(C) The value of g increases significantly at Doddabetta.
(D) Water boils at a lower temperature at Doddabetta.
(E) Answer not known

52. Match the scientific laws (List I) with their central concepts (List II):
List I: (Scientific laws)
P. Pascal's Law
Q. Hooke's Law
R. Universal Law of Gravitation
S. Bernoulli's Principle
List II: (Central concepts)
I. Stress and Strain
II. Fluid flow and Pressure
III. Enclosed fluid pressure transmission
IV. Mass and Distance
Which of the following correctly matches List I with List II?
(A) P-III, Q-I, R-IV, S-II
(B) P-II, Q-IV, R-I, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-I, R-II, S-III
(E) Answer not known

53. Consider the following statements regarding fluids:
I. Gases are highly compressible while liquids are practically incompressible.
II. Pascal's law applies to both liquids and gases.
III. Buoyant force is experienced only in liquids and not in gases.
IV. Surface tension is a property exhibited by both liquids and gases.
V. Viscosity is the internal friction present in both liquids and gases.

NODIA

Which of the above statement(s) is/are correct?
(A) I, II and V only
(B) I, II, III and V only
(C) II, IV and V only
(D) I, III and IV only
(E) Answer not known

54. Arrange the steps of the ISRO PSLV rocket launch from Sriharikota applying Newton's Laws:
I. Fuel undergoes combustion inside the rocket engine.
II. Exhaust gases are ejected downwards at high velocity.
III. An equal and opposite reaction force pushes the rocket upwards.
Which of the following represents the correct sequence?
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) III, II, I
(E) Answer not known

55. What is the primary disadvantage of excessive friction in a machine?
(A) It increases the velocity ratio.
(B) It increases the mechanical advantage beyond safe limits.
(C) It causes the machine to violate the law of conservation of momentum.
(D) It converts mechanical energy into useless heat, reducing efficiency.
(E) Answer not known

56. The quantity defined as the turning effect of a force about an axis of rotation is known as:
(A) Work
(B) Torque
(C) Power
(D) Impulse
(E) Answer not known

57. Consider the following statements about Energy:
I. Potential energy of an object depends on its height relative to a reference point.
II. Kinetic energy is inversely proportional to velocity.
III. The sum of kinetic and potential energies is called total mechanical energy.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) III only
(E) Answer not known

58. When a substance undergoes a phase change from liquid to gas without an increase in temperature, the heat supplied is utilized to:
(A) Increase the kinetic energy of the molecules.
(B) Expand the liquid container.
(C) Decrease the density of the molecules uniformly.
(D) Overcome the intermolecular forces of attraction.
(E) Answer not known

59. Match the everyday examples (List I) with the related physical concepts (List II):
List I: (Everyday examples)
P. Wringing wet clothes
Q. Dust removed from a carpet by beating
R. Hydraulic jack
S. Water droplets on lotus leaf
List II: (Physical concepts)
I. Surface Tension
II. Centrifugal Force
III. Inertia of Rest
IV. Pascal's Law
Which of the following correctly matches List I with List II?
(A) P-II, Q-III, R-IV, S-I
(B) P-III, Q-II, R-I, S-IV
(C) P-II, Q-IV, R-III, S-I
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

60. During a cricket match at the M. A. Chidambaram Stadium, a fielder lowers his hands while catching a fast-moving ball. This application of Newton's second law helps to:
(A) Decrease the change in momentum to ensure the ball does not bounce out easily.
(B) Increase impact time to reduce the average force exerted on the player's hands.
(C) Decrease the time of impact to ensure a quicker catch before the ball hits ground.
(D) Increase the effective mass of the ball to stabilize the catching motion in air.
(E) Answer not known

Click Here to Buy book on Amazon

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

61. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The velocity of a satellite orbiting the Earth increases as its orbital radius decreases.
Reason (R): The gravitational force of attraction increases with a decrease in distance, requiring a higher centripetal force and thus greater velocity to remain in orbit.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

62. Identify the correct statement regarding power.
(A) Power is the product of force and velocity.
(B) Power is a vector quantity.
(C) The SI unit of power is the Joule.
(D) One kilowatt is equal to one thousand joules.
(E) Answer not known

63. Which of the following pairs is incorrectly matched regarding units?
(A) Momentum - kg m s^{-1}
(B) Impulse - N s
(C) Acceleration - m s^{-1}
(D) Surface Tension - N m^{-1}
(E) Answer not known

64. Identify the incorrect statement about friction.
(A) Friction always opposes the relative motion between two surfaces in contact.
(B) Ball bearings are used to convert sliding friction into rolling friction.
(C) The coefficient of kinetic friction is less than the coefficient of static friction.
(D) Rolling friction is generally greater than sliding friction.
(E) Answer not known

65. Consider the following statements regarding couples and torque:
I. Two equal and opposite forces whose lines of action do not coincide constitute a couple.
II. A couple produces purely rotational motion without translational motion.
III. Turning a water tap is an everyday example of applying a couple.
IV. The moment of a couple depends on the axis of rotation chosen.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II and III only
(D) I and IV only
(E) Answer not known

66. When constructing tall temple gopurams in ancient Tamil Nadu architecture, a wide base was utilized. This structural feature primarily aims to:
(A) Raise the centre of mass to distribute wind pressure.
(B) Lower the centre of gravity and increase stability.
(C) Decrease the base area for artistic appeal.
(D) Maximize the potential energy of the structure.
(E) Answer not known

67. Arrange the following steps representing the sequence of an object undergoing free fall from rest:
I. The object's velocity is zero, and it begins to fall under gravity.
II. The object accelerates at approximately 9.8 m/s^2.
III. The object impacts the ground with maximum kinetic energy.
Which of the following represents the correct sequence?
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) I, III, II
(E) Answer not known

68. Which of the following defines 'Efficiency' of a simple machine?
(A) Ratio of work output to work input
(B) Ratio of load to effort
(C) Ratio of velocity of effort to velocity of load
(D) Product of mechanical advantage and velocity ratio
(E) Answer not known

NODIA

69. Match the simple machines (List I) with their practical examples (List II):
List I: (Simple machines)
P. Pulley
Q. Lever
R. Wedge
S. Inclined plane
List II: (Practical examples)
I. A knife
II. A staircase
III. Drawing water from a well
IV. A pair of scissors
Which of the following correctly matches List I with List II?
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-I, S-II
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

70. Based on Bernoulli's principle, what happens to the pressure of a fluid when its speed increases?
(A) The pressure decreases.
(B) The pressure remains constant.
(C) The pressure increases proportionally.
(D) The pressure fluctuates randomly.
(E) Answer not known

71. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A drop of liquid placed on a horizontal glass plate generally takes a spherical shape if the liquid drop is small.
Reason (R): For small drops, the effect of gravity is negligible compared to surface tension forces, which act to minimize surface area.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

72. Which of the following is a classic advantage of mechanical friction?
(A) Wear and tear of machine parts
(B) The ability of a person to walk on a road
(C) Generation of unwanted heat in engines
(D) Decrease in the efficiency of a bicycle
(E) Answer not known

73. Which of the following pairs is correctly matched regarding properties of matter?
(A) Elasticity - Property to deform permanently
(B) Condensation - Direct conversion of gas to solid
(C) Sublimation - Direct conversion of solid to gas
(D) Boiling - Surface phenomenon occurring at any temperature
(E) Answer not known

74. Consider the following statements about Gravitation:
I. Gravitational force is always attractive in nature.
II. Gravitational force between two objects is inversely proportional to the square of the distance between them.
III. The value of universal gravitational constant G was first determined by Henry Cavendish.
IV. Tides in the ocean are completely independent of the gravitational pull of the moon.
V. The Earth's gravity acts as a centripetal force for the orbiting moon.
Which of the above statement(s) is/are correct?
(A) I, II, III and V only
(B) I, II, III and IV only
(C) II, III and V only
(D) I, IV and V only
(E) Answer not known

75. Select the correct sequence for calculating the pressure exerted by a solid object on a table:
I. Calculate the weight (force) of the object using its mass.
II. Determine the base area of the object in contact with the table.
III. Divide the weight by the contact area.
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) I, III, II
(E) Answer not known

76. The term 'Kinetic Energy' is strictly defined as:
(A) Energy possessed by a body due to its position or configuration.

Downloaded from www.pdf.tube

(B) Energy possessed by a body by virtue of its motion.
(C) The total internal energy of an atom.
(D) The rate of doing work per unit time.
(E) Answer not known

77. Consider the following statements about Newton's laws:
I. The first law gives the definition of force.
II. The second law provides a measure of force.
III. The third law relates to the principle of conservation of momentum.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I only
(D) I and III only
(E) Answer not known

78. Which of the following is an example of an application of the principle of conservation of linear momentum?
(A) The upward thrust on a rocket due to expelled exhaust gases
(B) The cooling of water in an earthen pot
(C) The working of a hydraulic brake system
(D) The spinning of a top on its axis
(E) Answer not known

79. Match the following terms (List I) with their definitions (List II):
List I: (Terms)
P. Mass
Q. Weight
R. Density
S. Volume
List II: (Definitions)
I. The force of gravity acting on an object
II. The amount of matter contained in a body
III. The space occupied by an object
IV. Mass per unit volume
Which of the following correctly matches List I with List II?
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-III, R-I, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

80. When a fast-moving bus in Chennai suddenly stops, a standing passenger tends to fall forward. This phenomenon exemplifies:
(A) Newton's third law of motion
(B) Inertia of rest
(C) Archimedes' principle
(D) Inertia of motion
(E) Answer not known

81. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A wooden spoon floating in a hot sambar vessel does not sink.
Reason (R): The density of the wooden spoon is less than the density of the liquid sambar.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

82. Identify the correct statement regarding work and power.
(A) Work done against friction is generally positive.
(B) Work done by a centripetal force is always zero.
(C) Power is the product of work and time.
(D) 1 Watt is equal to 1 Joule per minute.
(E) Answer not known

NODIA

83. Which of the following pairs is incorrectly matched regarding simple machines?
(A) Class I Lever - Scissors
(B) Class II Lever - Wheelbarrow
(C) Class III Lever - Tongs
(D) Class II Lever - See-saw
(E) Answer not known

84. Identify the incorrect statement regarding fluid pressure.
(A) Liquid pressure at a particular depth is different in different directions.
(B) Pressure inside a liquid increases with depth.
(C) Liquid pressure depends on the density of the liquid.

(D) A liquid seeks its own level.
(E) Answer not known

85. Consider the following statements about Circular Motion:
I. Uniform circular motion is an accelerated motion.
II. The speed remains constant but velocity changes continuously.
III. Centripetal force does zero work.
IV. Centrifugal force is a real fundamental force in nature.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II and III only
(D) I and IV only
(E) Answer not known

86. During the construction of traditional wooden chariots (Ther) in Tamil Nadu, giant wheels and axles are used. A wheel and axle simple machine primarily provides:
(A) Mechanical advantage gained by distributing effort over a larger circumference.
(B) Reduction of frictional forces to nearly zero during heavy mechanical operations.
(C) High velocity ratio achieved without providing any real mechanical advantage.
(D) Increase of rotational energy to exceed the input work for faster locomotion.
(E) Answer not known

87. Arrange the following materials in increasing order of their typical density at standard temperature:
I. Gold
II. Water
III. Wood
Which of the following represents the correct sequence?
(A) III, II, I
(B) II, III, I
(C) I, II, III
(D) III, I, II
(E) Answer not known

88. The ratio of the velocity of the effort to the velocity of the load in a machine is called:
(A) Efficiency
(B) Velocity ratio
(C) Mechanical advantage
(D) Output power
(E) Answer not known

89. Match the following concepts (List I) with their formulae (List II):
List I: (Concepts)
P. Kinetic Energy
Q. Potential Energy
R. Work
S. Power
List II: (Formulae)
I. mgh
II. $(1/2)mv^2$
III. Work / Time
IV. Force x Displacement
Which of the following correctly matches List I with List II?
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

90. When water flows out of a tank through a small hole at the bottom, the velocity of efflux is determined primarily by the depth of the hole below the free surface. This is a direct application of:
(A) Hooke's Law
(B) Archimedes' Principle
(C) Pascal's Law
(D) Torricelli's Theorem (derived from Bernoulli's Principle)
(E) Answer not known

91. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): It is dangerous to stand near the edge of a platform when a fast train passes by.
Reason (R): According to Bernoulli's principle, the high speed of the air dragged by the train decreases the local air pressure, creating a net push towards the train.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.

Click Here to Buy book on Amazon

(D) A is false but R is true.
(E) Answer not known

92. In the context of elasticity, the ratio of longitudinal stress to longitudinal strain within the elastic limit is defined as:
(A) Bulk Modulus
(B) Young's Modulus
(C) Rigidity Modulus
(D) Poisson's Ratio
(E) Answer not known

93. Which of the following pairs is correctly matched regarding forces?
(A) Weight - Mass x Velocity
(B) Impulse - Force x Time
(C) Momentum - Force x Distance
(D) Pressure - Force x Area
(E) Answer not known

94. Consider the following statements about surface tension and viscosity:
I. Heating a liquid generally decreases its surface tension.
II. The viscosity of a liquid decreases with an increase in temperature.
III. The viscosity of gases increases with an increase in temperature.
IV. Surface tension is responsible for capillary action in plants.
V. Raindrops are spherical strictly due to the high viscosity of water.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV only
(B) I, II, III and V only
(C) II, III and IV only
(D) I, IV and V only
(E) Answer not known

95. Arrange the sequence of events applying Archimedes' principle to a submarine diving:
I. Water is taken into the ballast tanks.
II. The average density of the submarine becomes greater than that of sea water.
III. The submarine begins to sink downwards.
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) I, III, II
(E) Answer not known

96. What is the fundamental definition of 'Latent Heat'?
(A) Heat required to raise a body's temperature by one degree Celsius per unit mass.
(B) Total internal heat content of a closed thermodynamic system at equilibrium.
(C) Energy transferred through solid materials via direct molecular collision/conduction.
(D) Heat released or absorbed during a change of state at a constant temperature.
(E) Answer not known

97. Consider the following statements regarding scalar and vector quantities:
I. Temperature is a scalar quantity.
II. Acceleration is a vector quantity.
III. Current is a vector quantity because it has a direction of flow.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I only
(D) III only
(E) Answer not known

98. When measuring atmospheric pressure using a simple mercury barometer, the height of the mercury column at standard sea level is approximately:
(A) 76 mm
(B) 76 cm
(C) 100 cm
(D) 101.3 cm
(E) Answer not known

99. Match the following forces (List I) with their primary nature (List II):
List I: (Forces)
P. Gravitational force
Q. Frictional force
R. Normal force
S. Tension
List II: (Primary nature)
I. Force transmitted through a string or rope
II. Attractive force between masses
III. Opposes relative motion between contact surfaces
IV. Perpendicular contact force exerted by a surface
Which of the following correctly matches List I with List II?

Downloaded from www.pdf.tube

(A) P-II, Q-III, R-IV, S-I
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

100. During the Tamil month of Aadi, strong winds blow across the state. A windstorm can lift the thatched roof of a hut. This happens because:
(A) High-speed wind creates low pressure above the roof, and the higher pressure inside lifts it.
(B) High-speed wind creates high pressure above the roof, pushing it down initially before it rebounds.
(C) Wind creates static electricity that lifts the dry thatched materials.
(D) Wind decreases the density of the air inside the hut.
(E) Answer not known

101. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A person walking on a sandy beach feels more tired compared to walking on a concrete road.
Reason (R): Sand yields under the weight, decreasing the normal reaction and the forward frictional force available for propulsion.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

102. Identify the correct statement regarding mass and weight.
(A) Weight changes with location due to variations in gravity, but mass remains constant.
(B) Mass is measured in Newtons and weight in Kilograms.
(C) The mass of an object is zero in space, while its weight remains constant.
(D) Both mass and weight are intrinsic scalar properties of matter.
(E) Answer not known

103. Which of the following pairs is incorrectly matched regarding simple machine examples?
(A) Wedge - Chisel
(B) Wheel and axle - Screwdriver
(C) Pulley - Flagpole mechanism
(D) Inclined plane - See-saw
(E) Answer not known

NODIA

104. Identify the incorrect statement regarding states of matter.
(A) Solids have a definite shape and volume.
(B) Plasma consists of tightly packed uncharged particles at absolute zero.
(C) Liquids have a definite volume but no definite shape.
(D) Gases have neither a definite shape nor a definite volume.
(E) Answer not known

105. Consider the following statements about Projectile Motion:
I. The trajectory of a projectile is a parabola.
II. Range is maximum at an angle of projection of 45 degrees.
III. The vertical component of velocity remains constant throughout the flight.
IV. At maximum height, the velocity of the projectile is zero if projected vertically, but non-zero if projected at an angle.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) I, II and III only
(C) II and IV only
(D) I and III only
(E) Answer not known

106. In agriculture in Tamil Nadu, farmers use a simple lever system called a 'Picotah' (Yettram) to draw water from wells. The primary advantage of using such a simple machine is to:
(A) Decrease the net work required to lift water from deep agricultural wells.
(B) Increase the speed of water extraction to meet high irrigation demands instantly.
(C) Remove the influence of atmospheric pressure to allow easier water column rise.
(D) Shift effort direction and use counterweights to reduce manual physical labor.
(E) Answer not known

107. Arrange the following speeds in increasing order:
I. 36 km/h
II. 15 m/s
III. 10 m/s
Which of the following represents the correct sequence?
(A) I, III, II
(B) III, I, II
(C) II, I, III
(D) I, II, III
(E) Answer not known

108. The measure of the degree of compactness of a substance is its:
(A) Weight
(B) Density
(C) Viscosity
(D) Elasticity
(E) Answer not known

109. Match the physical phenomena (List I) with their primary causes (List II):
List I: (Physical phenomena)
P. Capillary rise
Q. Terminal velocity
R. Floating of iceberg
S. Hydraulic brakes
List II: (Primary causes)
I. Archimedes' Principle
II. Pascal's Law
III. Viscous drag and Gravity
IV. Surface Tension
Which of the following correctly matches List I with List II?
(A) P-IV, Q-III, R-I, S-II
(B) P-III, Q-IV, R-II, S-I
(C) P-IV, Q-II, R-I, S-III
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

110. The property by virtue of which a material regains its original shape and size after the removal of a deforming force is known as:
(A) Elasticity
(B) Plasticity
(C) Compressibility
(D) Viscosity
(E) Answer not known

111. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A small pin made of steel can be made to float on the surface of calm water.
Reason (R): Surface tension acts as an elastic membrane supporting the light pin.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

112. Identify the correct statement regarding centrifugal force.
(A) It is an actual force of interaction between two bodies.
(B) It acts towards the centre of the circular path.
(C) It is responsible for holding the planets in their orbits around the Sun.
(D) It is a pseudo-force experienced in a rotating frame of reference.
(E) Answer not known

113. Which of the following pairs is correctly matched regarding energy conversions?
(A) Electric Motor - Mechanical to Electrical Energy
(B) Solar Cell - Heat to Electrical Energy
(C) Microphone - Sound to Electrical Energy
(D) Steam Engine - Mechanical to Heat Energy
(E) Answer not known

114. Consider the following statements about Newton's Second Law:
I. Force is directly proportional to the rate of change of momentum.
II. It is the real law of motion because both the first and third laws can be derived from it.
III. The unit of force derived from this law is the Joule.
IV. It predicts that a heavier object falls faster than a lighter object in a vacuum.
V. It provides the formula $F = ma$ for a constant mass.
Which of the above statement(s) is/are correct?
(A) I, II and V only

Click Here to Buy book on Amazon

(B) I, II, III and V only
(C) II, IV and V only
(D) I, III and IV only
(E) Answer not known

115. Arrange the sequence for finding the density of an irregularly shaped solid:
I. Measure the mass of the solid using a physical balance.
II. Immerse the solid in water in a measuring cylinder to find its volume.
III. Divide the mass by the volume.
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) II, III, I
(E) Answer not known

116. A man pushes a heavy rock but fails to move it. In terms of physics, the work done by the man is:
(A) Zero
(B) Positive
(C) Negative
(D) Infinite
(E) Answer not known

117. Consider the following statements regarding simple machines:
I. A single fixed pulley has a mechanical advantage of 1 and only changes the direction of effort.
II. An inclined plane reduces the effort required by increasing the distance over which the effort is applied.
III. A class I lever always has a mechanical advantage greater than 1.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I only
(D) III only
(E) Answer not known

118. What is the fundamental difference between speed and velocity?
(A) Velocity has magnitude and direction, whereas speed possesses only magnitude.
(B) Speed is measured in m/s, whereas velocity is measured in km/h for vector math.
(C) Speed is a vector with specific direction, whereas velocity remains a scalar.
(D) Velocity is total distance over time, while speed is total displacement over time.
(E) Answer not known

119. Match the following states of matter (List I) with their fundamental properties (List II):
List I: (States of matter)
P. Solid
Q. Liquid
R. Gas
S. Plasma
List II: (Fundamental properties)
I. Highly ionized gas with free electrons and ions
II. Definite volume and shape
III. Highly compressible, fills container entirely
IV. Definite volume but takes shape of container
Which of the following correctly matches List I with List II?
(A) P-II, Q-IV, R-III, S-I
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-III, R-IV, S-I
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

120. In heavy goods vehicles traveling across the Western Ghats, multiple tyres are used on the rear axles. The physical principle behind this is to:
(A) Increase the speed of the vehicle.
(B) Decrease the pressure exerted on the road by increasing the area of contact.
(C) Increase the friction abruptly to prevent rolling.
(D) Elevate the centre of gravity of the truck.
(E) Answer not known

121. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Astronauts in the International Space Station experience weightlessness.
Reason (R): There is no gravity in low Earth orbit.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.

NODIA

(D) A is false but R is true.
(E) Answer not known

122. Identify the correct statement about boiling and evaporation.
(A) Evaporation is a bulk phenomenon, while boiling is a surface phenomenon.
(B) Boiling takes place at all temperatures, while evaporation occurs at a specific temperature.
(C) Impurities lower the boiling point of water.
(D) Evaporation causes cooling, but boiling does not.
(E) Answer not known

123. Which of the following pairs is incorrectly matched regarding forces?
(A) Frictional force - Magnetic pull between two magnets
(B) Centripetal force - Tension in a string whirling a stone
(C) Gravitational force - Force keeping the moon in orbit
(D) Buoyant force - Upward thrust on a ship
(E) Answer not known

124. Identify the incorrect statement regarding work and energy.
(A) Work done by gravity on a satellite in a circular orbit is zero.
(B) Kinetic energy can be negative.
(C) A compressed spring possesses potential energy.
(D) Energy is the capacity to do work.
(E) Answer not known

125. Consider the following statements about pressure:
I. Pressure is inversely proportional to the area over which a force is applied.
II. A sharp knife cuts easily because the cutting edge has a small area, yielding high pressure.
III. Camels can walk easily in deserts because their broad feet decrease the pressure on the sand.
IV. High heels exert less pressure on the ground than flat shoes of the same person.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II and III only
(D) I and IV only
(E) Answer not known

126. A swimmer in a pool pushes the water backward to move forward. This directly illustrates:
(A) Newton's third law of motion
(B) Newton's first law of motion
(C) Newton's second law of motion
(D) Law of conservation of mass
(E) Answer not known

127. Arrange the classes of levers based on the position of the fulcrum, effort, and load (from Class 1 to Class 3):
I. Fulcrum is between Load and Effort.
II. Load is between Fulcrum and Effort.
III. Effort is between Fulcrum and Load.
Which of the following represents the correct sequence?
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) II, III, I
(E) Answer not known

128. What is the fundamental property known as 'Inertia'?
(A) The tendency of an object to accelerate under a net force.
(B) The internal force within a fluid preventing flow.
(C) The turning effect of a coupled force system.
(D) The inherent property of a body to resist any change in its state of rest or uniform motion.
(E) Answer not known

129. Match the physical quantities (List I) with their specific measuring devices (List II):
List I: (Physical quantities)
P. Atmospheric pressure
Q. Mass
R. Weight
S. Liquid density
List II: (Measuring devices)
I. Hydrometer
II. Barometer
III. Spring balance
IV. Beam balance
Which of the following correctly matches List I with List II?
(A) P-II, Q-IV, R-III, S-I

Downloaded from www.pdf.tube

(B) P-III, Q-I, R-IV, S-II
(C) P-II, Q-III, R-I, S-IV
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

130. The speed of a freely falling body dropped from a tower in Chennai after 2 seconds (assuming $g = 9.8\ m/s^2$) is approximately:
(A) 4.9 m/s
(B) 19.6 m/s
(C) 9.8 m/s
(D) 39.2 m/s
(E) Answer not known

131. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Oil floats on the surface of water.
Reason (R): The density of oil is less than the density of water, and oil is immiscible in water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

132. What is a key disadvantage of static friction?
(A) It prevents a stationary object from moving easily when a small force is applied.
(B) It allows us to walk without slipping.
(C) It holds nails in wood.
(D) It keeps a ladder resting against a wall from slipping.
(E) Answer not known

133. Which of the following pairs is correctly matched regarding properties of fluids?
(A) Capillarity - Boiling of milk
(B) Surface Tension - Ice melting to water
(C) Viscosity - Blood flowing in arteries
(D) Buoyancy - Rainfall
(E) Answer not known

134. Consider the following statements about simple harmonic motion (SHM) and pendulums:
I. A simple pendulum executes SHM for small angular displacements.
II. The length of a seconds pendulum is approximately 1 metre.
III. The restoring force is directly proportional to displacement.
IV. The mass of the bob affects the time period of a simple pendulum.
V. The time period increases if the pendulum is taken to a higher altitude.
Which of the above statement(s) is/are correct?
(A) I, II, III and V only
(B) I, II, III and IV only
(C) II, III and V only
(D) I, IV and V only
(E) Answer not known

135. Arrange the states of matter based on their typical densities (from lowest to highest):
I. Iron (Solid)
II. Water (Liquid)
III. Steam (Gas)
Which of the following represents the correct sequence?
(A) III, II, I
(B) I, II, III
(C) I, III, II
(D) II, III, I
(E) Answer not known

NODIA

136. The property of matter by which it tends to regain its original state when external deforming forces are removed is measured by:
(A) Stress
(B) Modulus of Elasticity
(C) Strain
(D) Coefficient of Viscosity
(E) Answer not known

137. Consider the following statements regarding distance and displacement:
I. Distance is the total path length covered by a body.
II. Displacement is the shortest straight-line path between initial and final positions.
III. Displacement can never be equal to the distance.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I only
(D) III only
(E) Answer not known

138. In a lever, the point about which it can rotate freely is called the:
(A) Load point
(B) Effort point
(C) Centre of mass
(D) Fulcrum
(E) Answer not known

139. Match the following units (List I) with their quantities (List II):
List I: (Units)
P. Joule
Q. Watt
R. Newton-second
S. Pascal
List II: (Quantities)
I. Pressure
II. Work/Energy
III. Impulse
IV. Power
Which of the following correctly matches List I with List II?
(A) P-II, Q-IV, R-III, S-I
(B) P-IV, Q-II, R-I, S-III
(C) P-I, Q-IV, R-III, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

140. A bullet is fired horizontally from a rifle, and simultaneously a similar bullet is dropped from the same height. Neglecting air resistance, which hits the ground first?
(A) The fired bullet
(B) Both hit the ground at the same time
(C) The dropped bullet
(D) Depends on the mass of the bullets
(E) Answer not known

141. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): When ice melts, its volume decreases.
Reason (R): Water has its maximum density at 4 degrees Celsius, a phenomenon known as the anomalous expansion of water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

142. Identify the correct statement about the centre of gravity.
(A) A freely suspended object will come to rest with its centre of gravity vertically below the point of suspension.
(B) It is always inside the physical boundaries of an object.
(C) The centre of gravity of a uniform ring is on its circumference.
(D) It does not affect the stability of an object.
(E) Answer not known

143. Which of the following pairs is incorrectly matched regarding simple machines?
(A) Pulley - Used in cranes
(B) Inclined plane - A winding mountain road in Kodaikanal
(C) Wedge - A screw
(D) Wheel and axle - Doorknob
(E) Answer not known

144. Identify the incorrect statement regarding temperature and its effects.
(A) Heating a solid expands it.
(B) Specific heat capacity determines how much heat is needed to raise the temperature of a substance.
(C) Condensation is an exothermic process.
(D) The boiling point of water increases with a decrease in atmospheric pressure.
(E) Answer not known

145. Consider the following statements about Momentum and Impulse:
I. Impulse is the product of a large force acting over a short time.
II. The change in momentum of a body is equal to the impulse applied to it.
III. Airbags in cars reduce injury by increasing the time of impact, thereby reducing the average force.
IV. Momentum is a scalar quantity.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II and III only
(D) I and IV only

Click Here to Buy book on Amazon

(E) Answer not known

146. A cyclist applies brakes and comes to a halt. The kinetic energy of the bicycle is predominantly converted into:
(A) Potential energy
(B) Heat energy due to friction
(C) Sound energy
(D) Chemical energy
(E) Answer not known

147. Arrange the following actions in the order they occur during the capillary rise of water in a glass tube:
I. Adhesive forces pull water up the walls of the tube.
II. Surface tension acts to reduce the curved surface area, pulling the liquid column upward.
III. The weight of the liquid column balances the upward surface tension force.
Which of the following represents the correct sequence?
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) I, III, II
(E) Answer not known

148. The primary difference between evaporation and boiling is that:
(A) Evaporation occurs only at the surface at any temperature, while boiling occurs throughout the liquid at a specific temperature.
(B) Evaporation is rapid, while boiling is slow.
(C) Evaporation requires an external heat source, while boiling does not.
(D) Evaporation happens only in gases, while boiling happens in liquids.
(E) Answer not known

149. Match the following applications (List I) with their guiding principles (List II):
List I: (Applications)
P. Lactometer
Q. Hydraulic lift
R. Parachute descent
S. Sprayer / Atomizer
List II: (Guiding principles)
I. Pascal's Law
II. Bernoulli's Principle
III. Archimedes' Principle
IV. Fluid Friction (Drag)
Which of the following correctly matches List I with List II?
(A) P-III, Q-I, R-IV, S-II
(B) P-I, Q-III, R-II, S-IV
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

150. A stone tied to a string is whirled in a horizontal circle. If the string suddenly breaks, the stone will fly off:
(A) Tangentially to the circular path
(B) Radially inwards
(C) Radially outwards
(D) Straight down due to gravity immediately
(E) Answer not known

NODIA

151. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): In a hydraulic press, a small force applied on a small piston can lift a large weight on a large piston.
Reason (R): Pressure transmitted through the liquid is the same everywhere, so a larger area on the second piston results in a proportionally larger force.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

152. Which of the following defines mechanical advantage?
(A) The ratio of distance moved by effort to distance moved by load.
(B) The ratio of load moved to effort applied.
(C) The ratio of useful work output to total work input.
(D) The total energy saved by using the machine.
(E) Answer not known

153. Which of the following pairs is correctly matched regarding kinematics?

(A) Uniform velocity - Velocity changes direction but not magnitude
(B) Retardation - Positive acceleration
(C) Constant acceleration - Velocity changes by equal amounts in equal intervals of time
(D) Displacement - Total path covered
(E) Answer not known

154. Consider the following statements regarding the Bose-Einstein Condensate:
I. It is considered the fifth state of matter.
II. It is formed by cooling a gas of extremely low density to a fraction of a degree above absolute zero.
III. At this temperature, the atoms lose their separate identities and merge into a single quantum state.
IV. It was first predicted by Albert Einstein and Indian physicist Satyendra Nath Bose.
V. It exists naturally at room temperature in highly dense metals.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV only
(B) I, II, III and V only
(C) II, III and IV only
(D) I, IV and V only
(E) Answer not known

155. Arrange the correct sequence to determine the relative density of a liquid using a specific gravity bottle:
I. Weigh the empty specific gravity bottle.
II. Fill the bottle with the liquid and weigh it.
III. Fill the bottle with water and weigh it.
IV. Calculate the ratio of the mass of the liquid to the mass of the water.
(A) I, II, III, IV
(B) II, III, I, IV
(C) I, III, II, IV
(D) III, II, I, IV
(E) Answer not known

156. An athlete running in a race cannot stop immediately after crossing the finish line. This inability to stop suddenly is primarily due to:
(A) Inertia of rest
(B) Inertia of motion
(C) Centrifugal force
(D) Gravitational pull
(E) Answer not known

157. Consider the following statements about Newton's Third Law:
I. It applies only when objects are in physical contact.
II. Action and reaction forces act on two different bodies.
III. A book resting on a table pushes down on the table, and the table pushes up on the book with an equal force.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I only
(D) III only
(E) Answer not known

NODIA

158. When a mechanic uses a longer spanner to loosen a tight nut on a car wheel, the physical quantity primarily being increased is:
(A) The torque
(B) The applied force
(C) The friction
(D) The atmospheric pressure
(E) Answer not known

159. Match the everyday examples (List I) with their underlying properties of matter (List II):
List I: (Everyday examples)
P. A needle floating on water
Q. Syringe drawing medicine
R. Sweeping the floor with a broom
S. Shock absorbers in vehicles
List II: (Underlying properties)
I. Atmospheric Pressure
II. Surface Tension
III. Elasticity (Damping)
IV. Class III Lever
Which of the following correctly matches List I with List II?
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

160. A cricket ball is hit high into the air. At the absolute peak of its trajectory, what is true about its velocity and acceleration? (Neglecting air resistance)
(A) Velocity is zero, acceleration is zero.
(B) Velocity is non-zero (horizontal),

acceleration is zero.

(C) Velocity is zero, acceleration is downward (gravity).

(D) Velocity is non-zero (horizontal), acceleration is downward (gravity).

(E) Answer not known

www.nodia.in

Downloaded from www.pdf.tube

ANSWERS

1. (B) I and III only
Plasma represents a state of matter consisting of super-energetic and highly excited ionized gas particles. In contrast, Bose-Einstein Condensate is created by cooling a low-density gas to temperatures near absolute zero, not by heating. For solids, the particles are closely packed with minimal intermolecular spaces, which makes them essentially incompressible under normal atmospheric pressure and standard environmental conditions.

2. (B) Latent heat of fusion
Latent heat of fusion represents the thermal energy required to transform one kilogram of a solid substance into its liquid state without any change in temperature at its melting point. This energy is specifically utilized to overcome the strong intermolecular forces holding the solid lattice together, facilitating the phase transition at constant atmospheric pressure and thermal equilibrium.

3. (A) P-III, Q-I, R-IV, S-II
This match involves fundamental SI units used in physics. Density is defined as mass per unit volume, measured in kilograms per cubic metre. Weight is a force exerted by gravity, measured in Newtons. Pressure is the force applied per unit area, measured in Pascals. Finally, mass represents the quantity of matter in a body, measured in kilograms.

4. (A) Newton's first law of motion
Newton's first law of motion, or the law of inertia, states that an object will remain in its state of rest or uniform motion unless acted upon by an external force. The heavy potter's wheel possesses significant rotational inertia, which allows it to continue spinning steadily for a long duration even after the initial force is removed.

5. (A) Both A and R are true and R is the correct explanation of A.
Boiling occurs when the vapor pressure of a liquid equals the surrounding atmospheric pressure. At higher altitudes like Kodaikanal, the atmospheric pressure is lower than at sea level locations like Chennai. Consequently, water requires less thermal energy to reach its boiling point, causing it to boil at a lower temperature compared to standard sea-level atmospheric conditions.

NODIA

6. (A) Ratio of a substance's density to water's density at 4 degrees Celsius.
Relative density is a dimensionless quantity defined as the ratio of the density of a substance to the density of a reference material, typically water at four degrees Celsius. This specific temperature is used because water reaches its maximum density at this point. It helps determine whether a substance will sink or float in the reference fluid.

7. (D) Condensation - Gas changing into liquid
Condensation is the physical process where a substance in its gaseous phase transforms into a liquid state, typically through cooling or increased pressure. Other phase changes include sublimation, which is the direct transition from solid to gas, and freezing, which is liquid to solid. Evaporation specifically refers to the surface-level transition of a liquid into a gas.

8. (B) A spring balance is generally used to measure the mass of a body.
A spring balance measures the gravitational pull exerted on an object, which corresponds to its weight rather than its mass. Weight is a vector quantity that varies with the local acceleration due to gravity. Mass is a scalar quantity representing the total amount of matter and is typically measured using a beam balance to ensure locational independence.

9. (A) I, II and IV only
Archimedes' principle states that any body immersed in a fluid experiences an upward buoyant force equal to the weight of the displaced fluid. The centre of buoyancy corresponds to the centre of gravity of this displaced fluid volume. For an object to float, its density must be less than or equal to the density of the fluid.

10. (D) Impulse
Impulse is defined as the product of the average force applied to an object and the time interval over which it acts. It represents the total change in momentum experienced by the body. In sports like Jallikattu, the force required to stop a bull depends on the time taken to bring its momentum to zero during the interaction.

11. (B) II, III, I
The states of matter are distinguished by the strength of the attractive forces between their constituent particles. In gases, these intermolecular forces are extremely weak, allowing particles to move freely. Liquids exhibit stronger forces that maintain a fixed volume, while solids possess the strongest intermolecular attractions, which hold particles in a rigid, fixed structure with very little movement.

12. (B) Resistance to flow caused by internal friction of the fluid layers
Viscosity is a fundamental property of fluids that describes their internal resistance to flow, acting as friction between adjacent layers moving at different velocities. In the cardiovascular system, blood viscosity influences the ease with which it circulates through vessels. Changes in blood composition, such as in anemic conditions, can alter these viscous forces, impacting overall blood flow efficiency.

13. (A) P-III, Q-I, R-II, S-III
Levers are categorized based on the relative positions of the fulcrum, effort, and load. Class I levers, like see-saws and pliers, have the fulcrum in the middle. Class II levers, such as wheelbarrows, have the load in the center. Class III levers, exemplified by fishing rods, place the effort between the fulcrum and the load for speed.

14. (A) It increases the mechanical advantage, requiring less effort.
Placing the handle of a hand water pump farther from the fulcrum increases the length of the effort arm. According to the principle of moments, a longer effort arm results in a greater torque for the same amount of applied force. This increases the mechanical advantage of the lever system, allowing the user to lift water with less physical effort.

15. (A) Both A and R are true and R is the correct explanation of A.
A large ship made of steel floats because its hollow structure encloses a significant volume of air, making its average density much lower than that of seawater. This displacement of a large weight of water creates sufficient buoyant force. Conversely, a solid iron nail sinks because its density is much greater than water, and it displaces very little fluid.

16. (D) $N\ s\ m^{-2}$
The coefficient of viscosity measures the internal friction of a fluid and is defined by the ratio of shearing stress to the velocity gradient. Its SI unit is Newton-second per square metre, which is also equivalent to the Pascal-second. This unit quantifies how much force is required to maintain a specific velocity difference between adjacent layers of the fluid.

17. (C) Force - Pascal
Force is measured in Newtons, which represents the amount of effort required to accelerate a mass. In contrast, the Pascal is the SI unit for pressure, defined as one Newton of force applied per square metre of area. Work and energy are correctly measured in Joules, power in Watts, and frequency is measured in Hertz in standard physics.

18. (A) I, II, III and V only
Pressure is a scalar quantity, and Pascal's law describes how pressure is transmitted undiminished in enclosed fluids, forming the basis for hydraulic systems. Standard atmospheric pressure at sea level is approximately 101,325 Pascals. However, atmospheric pressure is measured using a barometer, not an anemometer, which is a device specifically designed for measuring wind speed and direction.

19. (B) II, I, III
The acceleration due to gravity on a celestial body's surface depends on its mass and radius. The Moon has the lowest gravity at about one-sixth of Earth's value. Earth follows with a standard gravity of nine point eight meters per second squared. Jupiter, being the most massive planet in the solar system, has the highest surface gravity among these three.

Click Here to Buy book on Amazon

20. (A) A force acting on a body in a circular path directed towards the centre.
Centripetal force is the net force required to keep an object moving in a curved or circular path. It is always directed toward the center of curvature, perpendicular to the object's instantaneous velocity. This force constantly changes the direction of the object's motion without necessarily changing its speed, thereby causing centripetal acceleration throughout the entire circular movement.

21. (C) II only
Speed is a scalar quantity defined as the rate of change of distance over time. Velocity, however, is a vector quantity representing the rate of change of displacement. While distance and speed are always positive or zero, displacement and velocity can be negative depending on the direction. Therefore, the statement defining speed as the change of displacement is incorrect.

22. (A) The rate of change of velocity of an object with respect to time.
Acceleration is a vector quantity that quantifies how quickly an object's velocity changes over a specific period. It can involve an increase in speed, a decrease in speed, or a change in the direction of motion. The standard unit for acceleration is meters per second squared, reflecting the change in velocity per second during the movement of the object.

23. (A) P-II, Q-I, R-IV, S-III
Static friction prevents the initiation of motion between two stationary surfaces. Kinetic friction acts when surfaces are in relative motion. Rolling friction is experienced by objects like wheels or spheres moving across a surface, and is typically much lower than sliding friction. Fluid friction, or drag, is the resistance encountered by an object moving through liquids or gases.

24. (B) Inertia of rest
Inertia of rest is the tendency of a body to remain stationary unless acted upon by an external force. When a train accelerates suddenly, the lower part of a passenger's body moves forward with the train, while the upper part tends to stay in its original position. This results in the passenger being pushed backward relative to the train's motion.

25. (A) Both A and R are true and R is the correct explanation of A.
When pulling a lawnmower, the applied force has an upward vertical component that reduces the effective downward weight of the machine. This decrease in weight reduces the normal reaction force from the ground. Since frictional force is directly proportional to the normal reaction, pulling encounters less resistance than pushing, where the vertical force component increases the effective weight.

26. (D) Action and reaction act on different bodies and are equal and opposite.
Newton's third law of motion states that for every action, there is an equal and opposite reaction. Critically, these two forces always act on different objects and therefore never cancel each other out. This principle explains various phenomena, such as how a swimmer moves forward by pushing water backward or how a rocket gains thrust by ejecting exhaust gases.

27. (A) Water stored in a dam - Potential energy
Potential energy is the energy possessed by an object due to its position, height, or configuration. Water stored at a height behind a dam has significant gravitational potential energy, which can be converted into kinetic energy when released. A moving car possesses kinetic energy, and a stretched bow has elastic potential energy, while a flying bird has both types.

28. (B) Acceleration due to gravity (g) increases as we go higher above the Earth's surface.
The acceleration due to gravity, denoted as g, is inversely proportional to the square of the distance from the Earth's center. As altitude increases and an object moves farther away from the Earth's surface, the gravitational pull weakens, causing the value of g to decrease. This value is zero at the center of the Earth and maximum near the poles.

29. (B) I and III only
Work is defined as the product of force and displacement in the direction of the force. If the displacement is perpendicular to the force, no work is performed. Power is the measure of the rate at which this work is done. Note that the work-energy theorem relates work to kinetic

NODIA

energy, and one horsepower is approximately seven hundred forty-six Watts.

30. (A) Distance
A scalar quantity is one that possesses only magnitude and no specific direction. Distance represents the total length of the path traveled by an object, regardless of its direction. In contrast, displacement, velocity, and acceleration are vector quantities because they include both magnitude and a defined direction of motion or change, which is essential for comprehensive physical analysis.

31. (B) I, II, III
Calculating the mechanical advantage of a simple machine involves a logical sequence of steps. First, one must identify and measure the effort applied to the system. Next, the weight of the load being lifted or moved must be determined. Finally, the mechanical advantage is calculated by finding the ratio of the load to the effort, indicating the machine's force-multiplying factor.

32. (D) Square of the time elapsed
For an object dropped from rest, the distance it falls under the influence of gravity is described by the kinematic equation s equals one-half g t squared. This formula shows that the distance is directly proportional to the square of the time elapsed, assuming air resistance is negligible. Consequently, the object covers more distance in each successive second of its fall.

33. (A) P-IV, Q-III, R-II, S-I
Several physical principles explain common phenomena. Surface tension causes raindrops to become spherical to minimize surface area. Pascal's law enables hydraulic lifts to multiply force through enclosed fluids. Bernoulli's principle explains the lift generated by aircraft wings due to pressure differences. Finally, Newton's third law of motion explains the recoil of a gun as an equal and opposite reaction.

34. (B) 45 degrees
The horizontal range of a projectile depends on the initial velocity and the angle of projection. Mathematically, the range formula involves the sine of twice the projection angle. Since the maximum value of the sine function occurs at ninety degrees, the range is maximized when the projection angle is forty-five degrees, providing the optimal balance between height and horizontal speed.

35. (A) Both A and R are true and R is the correct explanation of A.
When a bus turns sharply, passengers experience an outward push due to the inertia of direction. From the perspective of the rotating frame of reference, this is described as centrifugal force. This pseudo-force acts radially outward, as the passengers' bodies tend to maintain their original straight-line motion while the bus follows a curved path, causing them to lean outward.

36. (A) Within the elastic limit
Hooke's law states that the strain produced in a body is directly proportional to the stress applied to it, provided the deformation does not exceed the material's elastic limit. Within this range, the material will return to its original shape once the stress is removed. Beyond this limit, permanent deformation occurs, and the linear relationship between stress and strain ceases.

37. (C) Pulley - A crowbar
A crowbar is a practical application of a lever, specifically a Class I lever, used to multiply force by rotating around a fulcrum. It is not a pulley, which is a wheel on an axle designed to support movement and change the direction of a cable or belt. Wedges, inclined planes, and wheel-and-axle systems are other distinct types of machines.

38. (B) I, II and III only
The centre of mass is a point representing the average position of an object's matter, while the centre of gravity is where the total weight acts. For small objects, these points coincide. A lower centre of gravity actually increases stability. The Leaning Tower of Pisa remains stable because the vertical line from its centre of gravity still falls within its base.

39. (A) III, I, II
Viscosity varies significantly among different fluids based on their molecular structure and state. Air, being a gas, has a very low viscosity. Water is a liquid with a moderate internal resistance to flow. Honey, however, is a highly viscous liquid that flows much more slowly than water at room temperature. Therefore, the

Downloaded from www.pdf.tube

sequence from lowest to highest is air, water, and honey.

40. (B) Kinetic energy
The work-energy theorem states that the net work performed by all forces acting on an object is equal to the change in its kinetic energy. This principle links the concepts of force and motion, showing that if work is done on a body, its speed and energy of motion will change accordingly. It is a fundamental law used to solve various dynamics problems.

41. (A) I and II only
Elasticity involves stress, which is the internal restoring force per unit area, and strain, which is the fractional deformation. Strain is a ratio of like quantities and is therefore dimensionless and unitless. Notably, steel is considered more elastic than rubber in physics because it requires a much larger stress to produce a given strain and returns more accurately to its shape.

42. (D) Surface tension
Surface tension is the property of a liquid surface that causes it to behave like a stretched elastic membrane. It arises from the cohesive forces between liquid molecules, which pull the surface particles inward, effectively minimizing the total surface area. This phenomenon explains why small liquid drops are spherical and how certain insects can walk on the surface of calm water.

43. (A) P-II, Q-I, R-IV, S-III
Dimensional formulae represent physical quantities in terms of mass, length, and time. Force is mass times acceleration (MLT^{-2}). Work is force times distance (ML^2T^{-2}). Pressure is force divided by area ($ML^{-1}T^{-2}$). Finally, acceleration is the rate of change of velocity (LT^{-2}). These formulae are essential for checking the consistency of physical equations and understanding the relationships between different physical properties.

44. (B) Centripetal force
For any object to move in a circular path, a net force must act toward the center of the circle to constantly change the object's direction. This is known as centripetal force. In the sport of Silambam, the practitioner's hands and the tension within the staff provide this inward force, keeping the ends of the staff rotating in a stable circular motion.

45. (A) Both A and R are true and R is the correct explanation of A.
Whether an object sinks or floats depends on its density relative to the fluid. Iron has a higher density than water, so a solid iron block sinks. Wood generally has a lower density than water, allowing it to float. Even though they may have the same mass, the wooden block occupies a larger volume and displaces more water, creating more buoyancy.

46. (A) Momentum is the product of mass and velocity.
Momentum is a vector quantity defined as the product of an object's mass and its velocity. It represents the quantity of motion possessed by a body. In any closed system, the total linear momentum is conserved during collisions, regardless of whether they are elastic or inelastic. An object at rest has zero velocity and therefore possesses exactly zero momentum in any frame.

47. (C) Second Law - $F = ma$
Newton's second law of motion provides a quantitative measure of force, stating that the net force acting on an object is equal to the product of its mass and its acceleration. The first law is known as the law of inertia, while the third law is the law of action and reaction. These principles form the core foundation of classical mechanics in physics.

48. (D) The time period depends heavily on the mass of the bob.
The time period of a simple pendulum is determined by its length and the local acceleration due to gravity. Crucially, the period is independent of the mass or material of the pendulum bob, provided air resistance is negligible. At extreme positions, the bob momentarily stops, meaning its kinetic energy is zero and its potential energy is at a maximum during its oscillation.

49. (A) I, II and IV only
In projectile motion, the horizontal velocity remains constant because there is no horizontal force acting on the object. The vertical velocity changes uniformly due to the constant downward acceleration of gravity. At the highest point of

NODIA

the trajectory, the vertical component of velocity becomes zero. However, the overall path followed by the projectile is a parabola, not a hyperbola, in vacuum.

50. (A) I, II, III
When a liquid is heated, the added thermal energy first increases the kinetic energy of the molecules, causing the temperature to rise. As it reaches the boiling point, the energy is used to completely break the intermolecular bonds holding the molecules together. Finally, once these bonds are overcome, the substance undergoes a phase change, transitioning from a liquid state into a gas.

51. (D) Water boils at a lower temperature at Doddabetta.
Atmospheric pressure decreases as altitude increases because the density of the air column above becomes thinner. Since the boiling point of a liquid is the temperature at which its vapor pressure equals the external atmospheric pressure, water requires less heat to boil at high altitudes. Therefore, on peaks like Doddabetta, water will boil at a temperature below one hundred degrees Celsius.

52. (A) P-III, Q-I, R-IV, S-II
Different scientific laws describe various physical interactions. Pascal's law focuses on pressure transmission in enclosed fluids. Hooke's law establishes the relationship between stress and strain in elastic materials. Newton's universal law of gravitation describes the force between objects based on their mass and distance. Bernoulli's principle relates the speed of a fluid to the internal pressure and potential energy within the flow.

53. (A) I, II and V only
Fluids, including both liquids and gases, share several properties. Gases are highly compressible, whereas liquids are not. Both exhibit viscosity, which is internal friction during flow. Pascal's law correctly applies to all enclosed fluids. However, surface tension is a characteristic property of liquids only, and both liquids and gases can exert buoyant forces on objects immersed within them according to physics.

54. (C) III, I, II
A rocket launch is a classic application of Newton's laws of motion. According to the third law, every action has an equal and opposite reaction. First, the combustion of fuel occurs within the engine. This process generates high-pressure exhaust gases which are ejected downwards at high velocity. The resulting reaction force, or thrust, then pushes the rocket upwards into the atmosphere.

55. (D) It converts mechanical energy into useless heat, reducing efficiency.
Friction is a resistive force that occurs when two surfaces slide or move relative to each other. In machinery, excessive friction is disadvantageous because it converts a portion of the input mechanical energy into thermal energy. This heat is generally not useful and leads to energy loss, which significantly reduces the overall mechanical efficiency and causes wear and tear on the components.

56. (B) Torque
Torque, also known as the moment of force, is a measure of the turning or rotational effect produced by a force acting on an object about a specific axis. It is calculated as the product of the magnitude of the force and the perpendicular distance from the axis of rotation to the line of action of the force, measured in Newton-metres.

57. (C) I and III only
Potential energy is determined by an object's position or height relative to a reference level. Kinetic energy is the energy of motion and is directly proportional to the square of the object's velocity, not inversely proportional. The total mechanical energy of a system is the sum of its potential and kinetic energies, which remains constant in the absence of non-conservative forces.

58. (D) Overcome the intermolecular forces of attraction.
During a phase change, such as boiling, the temperature of the substance remains constant despite the continuous addition of heat. This energy, known as latent heat, is used to break the attractive intermolecular forces that hold the molecules in the liquid state. Once these bonds are overcome, the molecules can move freely as

Click Here to Buy book on Amazon

a gas, increasing the system's potential energy instead.

59. (A) P-II, Q-III, R-IV, S-I
Everyday tasks rely on various physical concepts. Wringing clothes uses centrifugal force to expel water. Beating a carpet relies on the inertia of rest to remove dust particles. Hydraulic jacks operate based on Pascal's law to lift heavy loads with minimal effort. Water droplets on a lotus leaf take a spherical shape due to surface tension, which minimizes the liquid's surface area.

60. (B) Increase impact time to reduce the average force exerted on the player's hands.
According to Newton's second law and the impulse-momentum theorem, the force experienced during a catch depends on the rate of change of momentum. By lowering his hands, a fielder increases the time interval over which the ball is brought to rest. This increase in impact time results in a smaller average force, thereby reducing the risk of injury or pain to the hands.

61. (A) Both A and R are true and R is the correct explanation of A.
For a satellite to remain in a stable circular orbit, the gravitational pull from Earth must provide the required centripetal force. As the orbital radius decreases, the gravitational force increases significantly. To balance this stronger pull and prevent falling into the planet, the satellite must travel at a higher orbital velocity, maintaining the equilibrium between gravity and the required centripetal acceleration.

62. (A) Power is the product of force and velocity.
Power is defined as the rate at which work is performed or energy is transferred over time. Mathematically, it can be expressed as the product of force and the instantaneous velocity in the direction of that force. While the SI unit is the Watt, which equals one Joule per second, power itself is a scalar quantity and does not have a direction.

63. (C) Acceleration - m s^{-1}
Physical quantities must be matched with their correct SI units for accurate measurement. Acceleration is defined as the rate of change of velocity per unit time, so its correct unit is metres per second squared. Metres per second is the unit for speed or velocity. Momentum and impulse are correctly measured in kilogram-metres per second and Newton-seconds, respectively, in standard science.

64. (D) Rolling friction is generally greater than sliding friction.
Rolling friction occurs when a circular object like a wheel or ball moves over a surface. It is significantly smaller than sliding or kinetic friction because the contact area is much smaller and the surfaces do not truly slide against each other. This is why wheels and ball bearings are highly effective at reducing resistance and increasing the efficiency of various mechanical systems.

65. (A) I, II and III only
A couple consists of two equal and opposite forces acting along different lines, creating a net torque that produces purely rotational motion without any translation. Common examples include turning a steering wheel or a water tap. Importantly, the moment of a couple is a constant value and does not depend on the specific point or axis chosen for the calculation of torque.

66. (B) Lower the centre of gravity and increase stability.
Stability of a structure depends on the height of its centre of gravity and the size of its base area. A wider base effectively lowers the overall centre of gravity of the monument and ensures that the vertical line passing through it remains well within the base. This design principle maximizes structural stability against external forces like wind or minor tremors in architecture.

67. (A) I, II, III
Free fall begins the moment an object is released from rest, starting with zero initial velocity. As it falls, gravity provides a constant downward acceleration, causing the object's speed to increase linearly with time. By the time the object reaches the ground, its potential energy has been largely converted into kinetic energy, resulting in a maximum velocity just before the impact occurs.

68. (A) Ratio of work output to work input
The efficiency of a simple machine is a measure of how much of the input work is converted

Downloaded from www.pdf.tube

into useful output work. It is expressed as a ratio or percentage. In an ideal machine, efficiency would be one hundred percent, but in practice, it is always less due to energy losses from friction, heat generation, and the weight of the machine's moving parts.

69. (A) P-III, Q-IV, R-I, S-II
Simple machines are ubiquitous in daily life. A pulley system is used to draw water from wells by changing the direction of effort. Scissors are an example of a double lever used for cutting. A knife acts as a wedge to split materials apart. A staircase serves as an inclined plane, allowing people to reach higher levels by traveling a longer distance.

70. (A) The pressure decreases.
Bernoulli's principle states that for an incompressible, non-viscous fluid in steady flow, the sum of pressure energy, kinetic energy, and potential energy per unit volume remains constant. Therefore, if the velocity of the fluid increases, its kinetic energy increases, which must be balanced by a corresponding decrease in the fluid's internal pressure to maintain the total energy of the system.

71. (A) Both A and R are true and R is the correct explanation of A.
Small liquid drops take a spherical shape because of surface tension, which acts to minimize the total surface area for a given volume. For very small volumes, the cohesive forces responsible for surface tension dominate over the downward pull of gravity. As the drop size increases, gravity becomes more significant, causing larger drops to flatten out into an oblate shape on surfaces.

72. (B) The ability of a person to walk on a road
While friction often causes energy loss and wear, it is essential for many daily activities. When a person walks, the friction between their shoes and the ground provides the necessary reactionary force to push forward without slipping. Without this friction, it would be impossible to maintain traction, just as it is difficult to walk on a perfectly smooth, icy surface.

73. (C) Sublimation - Direct conversion of solid to gas
Sublimation is a phase transition where a solid turns directly into a gas without passing through the liquid phase, as seen with dry ice or naphthalene. Elasticity is the ability to regain original shape, not deform permanently. Condensation is gas to liquid, and boiling is a bulk phenomenon that occurs at a specific temperature throughout the entire volume of the liquid.

74. (A) I, II, III and V only
Gravitation is a universal attractive force between all masses, following an inverse-square law with distance. Henry Cavendish first measured the universal gravitational constant. Earth's gravity provides the centripetal force for the Moon. However, ocean tides are significantly influenced by the Moon's gravitational pull, so they are not independent of it. This interaction causes the periodic rise and fall of sea levels.

75. (A) I, II, III
To determine the pressure a solid object exerts on a surface, one must follow a specific calculation sequence. First, the force is found by calculating the object's weight, which is mass multiplied by gravity. Next, the contact area where the object touches the surface is measured. Finally, pressure is calculated by dividing the weight by this contact area, expressed in Pascals.

76. (B) Energy possessed by a body by virtue of its motion.
Kinetic energy is a scalar quantity that represents the energy an object possesses because of its movement. It is calculated as one-half of the product of the object's mass and the square of its speed. This energy is always positive or zero and depends on the frame of reference. Any object with mass that is in motion will possess some kinetic energy.

77. (B) II and III only
Newton's laws provide a comprehensive framework for mechanics. The second law defines force quantitatively as the rate of change of momentum. The third law, concerning action and reaction, is intrinsically linked to the law of conservation of momentum in closed systems. While the first law describes the concept of

NODIA

inertia, it is the second law that provides the mathematical measure of force.

78. (A) The upward thrust on a rocket due to expelled exhaust gases
Rocket propulsion is a primary application of the conservation of linear momentum. As the rocket ejects high-velocity exhaust gases downward, it gains an equal and opposite momentum upward. The total momentum of the system remains constant throughout the process. This principle differs from hydraulic systems which use Pascal's law or cooling processes which rely on evaporation and thermal energy transfer.

79. (A) P-II, Q-I, R-IV, S-III
This match clarifies fundamental physical properties. Mass is the intrinsic amount of matter in an object. Weight is the gravitational force acting upon that mass. Density describes how compactly the matter is packed, defined as mass per unit volume. Volume is the measure of three-dimensional space an object occupies. Understanding these distinctions is crucial for solving problems in physics and engineering.

80. (D) Inertia of motion
Inertia of motion is the tendency of an object to continue moving in its current state unless stopped by an external force. When a bus stops suddenly, the passenger's feet stop along with the vehicle due to friction, but the upper body continues to move forward at the original speed. This results in the person falling forward relative to the stationary bus.

81. (A) Both A and R are true and R is the correct explanation of A.
According to the law of floatation, an object will float in a liquid if its average density is less than the density of the liquid it displaces. Wood is generally less dense than water-based liquids like sambar. Therefore, a wooden spoon experiences an upward buoyant force equal to its weight before it can sink, allowing it to remain on the surface.

82. (B) Work done by a centripetal force is always zero.
Work is defined as the product of force and displacement in the direction of that force. In circular motion, the centripetal force acts toward the center, which is always perpendicular to the instantaneous displacement of the object along the tangent. Since the angle between force and displacement is ninety degrees, the work done by centripetal force is always zero in any circular path.

83. (D) Class II Lever - See-saw
A see-saw is a classic example of a Class I lever, where the fulcrum is positioned between the effort and the load. In a Class II lever, the load is placed between the fulcrum and the effort, such as in a wheelbarrow or a nutcracker. Class III levers, like tongs or tweezers, have the effort applied between the fulcrum and the load.

84. (A) Liquid pressure at a particular depth is different in different directions.
One of the fundamental properties of fluids is that at any given depth, the pressure exerted by the liquid is equal in all directions. This pressure depends only on the depth, the density of the liquid, and the local acceleration due to gravity. Liquid pressure does not depend on the shape of the container, as a liquid will always seek its own level.

85. (A) I, II and III only
Uniform circular motion involves constant speed, but since the direction of motion changes continuously, the velocity also changes, making it an accelerated motion. The centripetal force acts perpendicular to motion, so it does no work. Centrifugal force is not a fundamental force; it is a pseudo-force observed only from within a rotating frame of reference to explain the tendency to move outward.

86. (A) Mechanical advantage gained by distributing effort over a larger circumference.
A wheel and axle is a simple machine where a larger wheel is attached to a smaller axle. When effort is applied to the outer rim of the wheel, it is distributed over a larger circumference, resulting in a greater torque on the axle. This provides a mechanical advantage, allowing heavy loads to be moved with significantly less force than would otherwise be required.

87. (A) III, II, I
Density is an intrinsic property of materials that describes their mass per unit volume.

Click Here to Buy book on Amazon

Wood is generally the least dense of these three, followed by liquid water, which has a density of approximately one gram per cubic centimetre. Gold is a very dense metal, with a much higher density than both wood and water. Thus, the correct sequence is wood, water, and gold.

88. (B) Velocity ratio
The velocity ratio of a machine is defined as the ratio of the distance moved by the effort to the distance moved by the load in the same time interval. Equivalently, it is the ratio of the velocity of the effort to the velocity of the load. This is a purely geometric property of the machine and does not change with friction or load.

89. (A) P-II, Q-I, R-IV, S-III
Physics uses specific formulae to quantify energy and work. Kinetic energy is calculated as one-half mv squared. Potential energy is mass times gravity times height. Work is defined as the product of force and displacement. Power is the rate at which work is performed, calculated as work divided by time. These relationships are fundamental for analyzing mechanical systems and energy transformations in various scenarios.

90. (D) Torricelli's Theorem (derived from Bernoulli's Principle)
Torricelli's theorem states that the speed of efflux of a fluid through a small hole at the bottom of a tank is the same as the speed a body would acquire in falling freely from the fluid surface to the hole. This velocity depends primarily on the depth of the opening below the free surface and is a specific application of Bernoulli's energy principle.

91. (A) Both A and R are true and R is the correct explanation of A.
When a train passes at high speed, it drags the surrounding air along with it. According to Bernoulli's principle, this increased air speed results in a localized drop in air pressure near the train. The higher atmospheric pressure behind a person standing nearby then creates a net force pushing them toward the low-pressure area, which can lead to a dangerous accident.

92. (B) Young's Modulus
Young's Modulus is a measure of the elasticity of a solid material in tension or compression. It is defined as the ratio of longitudinal stress to longitudinal strain, provided the material is within its elastic limit. This constant quantifies how much a material will stretch or compress under a specific load, reflecting the stiffness and atomic bonding strength of the substance.

93. (B) Impulse - Force x Time
Impulse is the change in momentum of an object, calculated as the product of the average force applied and the duration for which it acts. Weight is mass times gravity, not velocity. Momentum is the product of mass and velocity, while pressure is force divided by area. Understanding these basic definitions is essential for correctly analyzing the dynamics and forces acting on objects.

94. (A) I, II, III and IV only
Surface tension and viscosity are temperature-dependent fluid properties. Increasing the temperature typically reduces both surface tension and the viscosity of liquids, though it increases gas viscosity. Surface tension is responsible for capillary action, which helps plants transport water. While raindrops are spherical due to surface tension, viscosity is a measure of internal friction and does not determine the final shape of the falling drop.

95. (A) I, II, III
A submarine controls its buoyancy using ballast tanks. To dive, the submarine takes seawater into these tanks, which increases the overall mass of the vessel without changing its volume. Consequently, the average density of the submarine becomes greater than the density of the surrounding seawater. This creates a net downward force that overcomes buoyancy, causing the submarine to sink below the surface.

96. (D) Heat released or absorbed during a change of state at a constant temperature.
Latent heat is the thermal energy required to change the phase of a substance, such as melting a solid or boiling a liquid, without increasing its temperature. During this process, the energy is used to change the molecular arrangement and overcome intermolecular bonds rather than increasing the kinetic energy of the particles, thus maintaining a constant temperature until the transition is complete.

NODIA

97. (A) I and II only
Scalar quantities have only magnitude, like temperature and electric current. Vector quantities have both magnitude and direction, like acceleration. Although electric current has a direction of flow, it is considered a scalar because it does not follow the laws of vector addition. Therefore, statements identifying temperature as scalar and acceleration as vector are correct, but the statement about current is physically incorrect.

98. (B) 76 cm
A mercury barometer measures atmospheric pressure by the height of the mercury column it can support. At standard sea level and normal temperature, the atmosphere exerts enough pressure to hold a column of mercury approximately seventy-six centimetres, or seven hundred sixty millimetres, high. This value corresponds to one standard atmosphere of pressure, which is roughly one hundred one point three kilopascals.

99. (A) P-II, Q-III, R-IV, S-I
Different forces have distinct primary natures in physics. Gravitational force is the universal attraction between masses. Frictional force acts parallel to contact surfaces to oppose relative motion. Normal force is the perpendicular support force exerted by a surface. Tension is the pulling force transmitted through a string, rope, or cable. These forces are fundamental to analyzing the mechanical equilibrium and motion of bodies.

100. (A) High-speed wind creates low pressure above the roof, and the higher pressure inside lifts it.
According to Bernoulli's principle, as the speed of a fluid increases, its pressure decreases. During a windstorm, high-velocity air flows over the curved or slanted surface of a thatched roof, creating a low-pressure zone above it. The relatively higher, stagnant air pressure inside the hut then exerts an upward force that can lift the roof off the structure entirely.

101. (A) Both A and R are true and R is the correct explanation of A.
Walking requires a firm surface that provides a strong normal reaction and sufficient friction to propel the body forward. Sand is a yielding medium that shifts under pressure, absorbing energy and reducing the effective normal reaction. This reduction in the reactionary force and the accompanying decrease in available forward friction make walking on sand significantly more physically demanding than walking on a solid surface.

102. (A) Weight changes with location due to variations in gravity, but mass remains constant.
Mass is an intrinsic property of an object representing the total amount of matter it contains, and it remains the same everywhere in the universe. Weight, however, is the force of gravity acting on that mass. Because the acceleration due to gravity varies depending on the planet or altitude, an object's weight will change, even though its mass stays constant.

103. (D) Inclined plane - See-saw
A see-saw is a Class I lever, not an inclined plane. An inclined plane is a flat, tilted surface that allows loads to be raised using less force over a longer distance. Other examples like wedges for chisels, pulleys for flagpoles, and wheel-and-axle systems for screwdrivers are correctly matched. Understanding these categories is essential for identifying how different simple machines provide mechanical advantages.

104. (B) Plasma consists of tightly packed uncharged particles at absolute zero.
Plasma is actually a state of matter consisting of highly energized, ionized gas containing free electrons and ions. It typically exists at extremely high temperatures, such as those found in stars or lightning, rather than at absolute zero. The other statements correctly describe the definite shape and volume of solids, the fixed volume of liquids, and the variable shape and volume of gases.

105. (A) I, II and IV only
Projectile motion follows a parabolic trajectory, with the horizontal range being maximized at a projection angle of forty-five degrees. The vertical velocity changes due to gravity, becoming zero at the maximum height for vertical motion. However, if projected at an angle, the object still possesses horizontal velocity at its peak. The statement that vertical velocity remains constant is incorrect because gravity continuously accelerates it.

Downloaded from www.pdf.tube

106. (D) Shift effort direction and use counterweights to reduce manual physical labor.
A Picotah is a traditional lever system that uses a long pole and a counterweight to lift water from a well. By utilizing a heavy weight on one end, the machine significantly reduces the manual effort required to raise the water-filled bucket. It allows the farmer to use their body weight and gravity to assist the lifting process, making irrigation more efficient.

107. (B) III, I, II
To compare these speeds, we convert them all to metres per second. Thirty-six kilometres per hour equals ten metres per second. Therefore, ten metres per second and thirty-six kilometres per hour are equivalent speeds. Fifteen metres per second is faster than both. Arranging them from lowest to highest, ten metres per second and its equivalent come first, followed by the faster speed of fifteen metres per second.

108. (B) Density
Density is a physical property that measures the degree of compactness of a substance, defined as its mass per unit volume. It indicates how much matter is packed into a given space. Substances with high density have more mass in a smaller volume, while low-density substances are more spread out. This property is fundamental in determining whether an object will sink or float in a fluid.

109. (A) P-IV, Q-III, R-I, S-II
Various physical phenomena have specific underlying causes. Capillary rise is driven by surface tension and adhesive forces. Terminal velocity is achieved when the downward force of gravity is balanced by upward viscous drag. Icebergs float according to Archimedes' principle of buoyancy. Hydraulic brakes function based on Pascal's law, which states that pressure applied to an enclosed fluid is transmitted equally in all directions.

110. (A) Elasticity
Elasticity is the physical property of a material that allows it to return to its original dimensions and shape after the external deforming forces are removed. This behavior occurs because of the restoring forces that arise between the atoms or molecules when they are displaced. If a material does not return to its original shape, it is described as exhibiting plasticity or permanent deformation.

111. (A) Both A and R are true and R is the correct explanation of A.
Although steel is denser than water, a small, light pin can float on the water's surface if placed carefully. This happens because surface tension creates an effect similar to a thin, elastic membrane on the liquid's surface. The cohesive forces between water molecules are strong enough to support the weight of the pin, preventing it from breaking through and sinking to the bottom.

112. (D) It is a pseudo-force experienced in a rotating frame of reference.
Centrifugal force is not a real force resulting from physical interaction; rather, it is a pseudo-force or inertial force. It appears to act on an object moving in a circular path when viewed from a rotating frame of reference, directed away from the center. This sensation arises from the object's inertia as it resists the change in direction required for circular motion.

113. (C) Microphone - Sound to Electrical Energy
A microphone is a transducer that converts sound energy, which consists of pressure waves in the air, into electrical signals. This is the opposite of a loudspeaker. Electric motors convert electrical energy into mechanical energy, solar cells convert light into electricity, and steam engines convert thermal energy into mechanical work. Each device is designed for a specific type of energy transformation in physics.

114. (A) I, II and V only
Newton's second law states that force is proportional to the rate of change of momentum, which provides the quantitative formula F equals ma. It is considered the real law of motion from which the others can be derived. However, the unit of force is the Newton, not the Joule, and it predicts that all objects fall at the same rate in a vacuum.

115. (A) I, II, III
To find the density of an irregular solid, one first measures its mass using a physical balance. Next, the solid's volume is determined by immersing

NODIA

it in a liquid inside a measuring cylinder and calculating the volume of the liquid displaced. Finally, density is calculated by dividing the measured mass by the determined volume, typically expressed in grams per cubic centimetre or kilograms per cubic metre.

116. (A) Zero
In physics, work is defined as the product of the force applied to an object and the displacement of the object in the direction of that force. If a person applies a large force to a rock but the rock does not move, the displacement is zero. Consequently, according to the mathematical definition, no work has been performed on the rock, regardless of the effort.

117. (A) I and II only
A single fixed pulley has a mechanical advantage of one and is used solely to change the direction of the applied effort. An inclined plane allows a load to be lifted with less effort by increasing the distance traveled. However, the mechanical advantage of a Class I lever depends on the relative lengths of the effort and load arms and can be less than one.

118. (A) Velocity has magnitude and direction, whereas speed possesses only magnitude.
Speed is a scalar quantity that describes only how fast an object is moving, regardless of its path. Velocity is a vector quantity that includes both the speed of the object and the specific direction of its motion. For example, a car moving at sixty kilometres per hour has speed, while a car moving sixty kilometres per hour north has a defined velocity.

119. (A) P-II, Q-IV, R-III, S-I
Each state of matter has distinct physical characteristics. Solids have a definite shape and volume. Liquids maintain a fixed volume but take the shape of their container. Gases are highly compressible and will expand to fill any container entirely. Plasma is a state consisting of highly ionized gas with free electrons and ions, which is the most common form of matter in the universe.

120. (B) Decrease the pressure exerted on the road by increasing the area of contact.
Pressure is defined as the force applied per unit area. Heavy vehicles have multiple tires on their rear axles to increase the total surface area in contact with the road. By distributing the heavy weight of the vehicle over a larger area, the pressure exerted on the road surface is significantly reduced. This helps prevent damage to the road and improves vehicle stability during transport.

121. (C) A is true but R is false.
Astronauts in orbit experience weightlessness because they are in a state of continuous free fall towards Earth along with their spacecraft. However, the claim that there is no gravity in space is incorrect. Gravity at the altitude of the International Space Station is still about ninety percent as strong as on the surface, providing the force needed to maintain the satellite's circular orbit.

122. (D) Evaporation causes cooling, but boiling does not.
Evaporation is a surface phenomenon that occurs at all temperatures, where the fastest-moving molecules escape the liquid, thereby reducing the average kinetic energy and temperature of the remaining liquid. This results in a cooling effect. Boiling, however, is a bulk phenomenon that occurs only at a specific temperature throughout the liquid. Impurities typically increase the boiling point rather than lowering it for most liquids.

123. (A) Frictional force - Magnetic pull between two magnets
Friction is a contact force that opposes the relative motion between two surfaces. Magnetic pull, however, is a non-contact force that acts through a magnetic field and does not depend on physical surface interaction or sliding. Centripetal force can be provided by tension, gravitational force keeps planets in orbit, and buoyancy is the upward thrust in fluids, all of which are correctly matched.

124. (B) Kinetic energy can be negative.
Kinetic energy is calculated as one-half mv squared. Since mass is positive and the square of velocity is always positive or zero, kinetic

Click Here to Buy book on Amazon

energy can never be a negative value. Energy is the capacity to do work, and a compressed spring correctly holds potential energy. Additionally, work done by gravity on a satellite in circular orbit is zero because the force is always perpendicular to motion.

125. (A) I, II and III only
Pressure is inversely proportional to the area over which a force acts. This explains why sharp knives cut easily and why camels have broad feet to avoid sinking in sand. However, the statement about high heels is incorrect; because the heel has a very small contact area, it exerts much higher pressure on the ground than flat shoes, even for the same person's weight.

126. (A) Newton's third law of motion
Newton's third law states that for every action, there is an equal and opposite reaction. When a swimmer pushes the water backward with their hands and feet, the water exerts an equal and opposite force forward on the swimmer. This reactionary force is what propels the swimmer through the pool, demonstrating that forces always occur in pairs acting on two different bodies.

127. (A) I, II, III
Levers are classified by the relative positions of the fulcrum, effort, and load. In Class 1, the fulcrum sits between the load and effort. In Class 2, the load is between the fulcrum and effort. In Class 3, the effort is between the fulcrum and load. This standard classification system helps in analyzing the mechanical advantage and function of various tools and biological structures.

128. (D) The inherent property of a body to resist any change in its state of rest or uniform motion.
Inertia is a fundamental property of matter that describes an object's resistance to any change in its state of motion. An object at rest tends to stay at rest, and an object in motion tends to maintain its velocity unless acted upon by an external net force. The amount of inertia possessed by an object is directly proportional to its mass.

129. (A) P-II, Q-IV, R-III, S-I
Different physical quantities require specific instruments for measurement. A barometer is used to determine atmospheric pressure. A beam balance measures mass by comparing it to standard weights. A spring balance measures weight by the extension of a spring under gravity. A hydrometer is used to measure the density or relative density of liquids based on the principle of buoyancy and displacement.

130. (B) 19.6 m/s
For a freely falling body, the velocity after a certain time can be calculated using the equation v equals u plus gt. Starting from rest, the initial velocity u is zero. With gravity g being nine point eight metres per second squared and time t being two seconds, the final velocity becomes nineteen point six metres per second, assuming no air resistance acts on the body.

131. (A) Both A and R are true and R is the correct explanation of A.
According to the principle of floatation, a substance will float on a liquid if its density is lower than that of the liquid. Most oils have a lower density than water. Furthermore, since oil and water are immiscible, the oil does not dissolve but instead forms a distinct layer on the surface, where it is supported by the upward buoyant force.

132. (A) It prevents a stationary object from moving easily when a small force is applied.
Static friction is the force that resists the initiation of sliding motion between two surfaces. While it is useful for stability and walking, it can be a disadvantage when trying to move a heavy stationary object. One must apply a force greater than the maximum static friction, known as limiting friction, to overcome this resistance and begin the object's movement across the surface.

133. (C) Viscosity - Blood flowing in arteries
Viscosity is the measure of internal friction in a fluid that determines its resistance to flow. Blood flow in the human circulatory system is a significant biological application where viscosity plays a critical role in cardiovascular health and hemodynamics. Other phenomena like boiling or melting are phase changes, while buoyancy relates to displaced fluid weight, which are different physical concepts from viscosity or capillarity.

NODIA

134. (A) I, II, III and V only
A simple pendulum exhibits simple harmonic motion for small angles, with a restoring force proportional to displacement. The period of a seconds pendulum is two seconds, corresponding to a length of about one metre. The time period increases at higher altitudes because gravity is weaker. Notably, the mass of the pendulum bob has no effect on the time period of its oscillation.

135. (A) III, II, I
Density typically increases as matter transitions from gas to liquid to solid. Steam, being a gas, has the lowest density because its molecules are widely spaced. Water is a liquid with much higher density. Iron is a solid metal where the atoms are closely packed in a rigid structure, giving it the highest density among the three. Therefore, the sequence is steam, water, and iron.

136. (B) Modulus of Elasticity
The modulus of elasticity is a numerical constant that represents a material's resistance to being deformed elastically when a stress is applied. It is defined as the ratio of stress to strain within the elastic limit. A higher modulus indicates a stiffer material that more effectively regains its original shape and size after the deforming forces are removed, reflecting its strong internal molecular bonds.

137. (A) I and II only
Distance is a scalar quantity representing the total path length traveled, while displacement is a vector quantity representing the shortest straight-line distance between the start and end points. While distance is usually greater than displacement, they can be equal if an object moves in a perfectly straight line without changing direction. Therefore, the statement that displacement can never equal distance is incorrect.

138. (D) Fulcrum
In the context of simple machines, specifically levers, the fulcrum is the fixed pivot point around which the lever rotates. The position of the fulcrum relative to the effort and the load determines the class of the lever and its mechanical advantage. It is the central element that allows the lever to multiply force or increase the distance over which work is done.

139. (A) P-II, Q-IV, R-III, S-I
This match links units with their respective physical quantities. The Joule is the SI unit for work and energy. The Watt is the unit for power, which is the rate of doing work. Newton-second is the unit for impulse, representing the change in momentum. Finally, the Pascal is the SI unit for pressure, defined as force applied per unit of area.

140. (B) Both hit the ground at the same time
In the absence of air resistance, horizontal and vertical motions are completely independent. Even though one bullet has a high horizontal velocity, both bullets start with zero vertical velocity and are subject to the same downward acceleration due to gravity. Consequently, they will both fall the same vertical distance in the same amount of time and hit the ground simultaneously.

NODIA

141. (A) Both A and R are true and R is the correct explanation of A.
Water exhibits anomalous expansion, meaning it is most dense at four degrees Celsius. When ice melts at zero degrees Celsius, it transitions into liquid water which is denser than the ice itself. Because the same mass of water now occupies less space than the original ice, the total volume decreases. This unique property of water is essential for aquatic life in freezing climates.

142. (A) A freely suspended object will come to rest with its centre of gravity vertically below the point of suspension.
A suspended object is in stable equilibrium when its centre of gravity is at the lowest possible position. This occurs when it lies directly below the point of support. While the centre of gravity is the point where total weight acts, it does not necessarily have to be within the physical material of the object, as seen in rings or hollow spheres.

143. (C) Wedge - A screw
A screw is technically defined as an inclined plane wrapped around a central cylinder or cone in a spiral form. It is not a wedge, which is two inclined planes joined back-to-back used for splitting or lifting. Other matches, such as pulleys in cranes, winding roads as inclined planes, and

doorknobs as wheel-and-axle systems, are correct examples of how simple machines work.

144. (D) The boiling point of water increases with a decrease in atmospheric pressure.
The boiling point of a liquid is directly related to the surrounding pressure. When atmospheric pressure decreases, such as at high altitudes, the boiling point also decreases because less thermal energy is required for vapor pressure to equal the external pressure. Therefore, the statement claiming that the boiling point increases with a decrease in pressure is scientifically incorrect according to thermodynamics.

145. (A) I, II and III only
Impulse is the product of force and time, and it equals the change in an object's momentum. Safety devices like airbags increase the duration of impact, which significantly reduces the average force exerted on a person during a collision. While these statements are correct, momentum is actually a vector quantity, not a scalar, because it possesses both magnitude and a specific direction.

146. (B) Heat energy due to friction
When brakes are applied to a moving bicycle, the kinetic energy of the wheels is dissipated through friction between the brake pads and the rims or discs. This process converts the energy of motion into thermal energy, causing the temperature of the braking components to rise. Most of this mechanical energy is lost as useless heat to the surrounding environment during the stop.

147. (A) I, II, III
Capillary action occurs through a sequence of molecular forces. First, adhesive forces between the liquid and the tube wall pull the liquid upward, creating a curved surface called a meniscus. Surface tension then acts to reduce this surface area, effectively pulling the entire liquid column higher into the tube. This upward movement continues until the weight of the liquid column perfectly balances the surface tension force.

148. (A) Evaporation occurs only at the surface at any temperature, while boiling occurs throughout the liquid at a specific temperature.
Evaporation is a slow, surface-level process where molecules with enough kinetic energy escape into the air, happening at temperatures below the boiling point. Boiling is a rapid, bulk process that occurs throughout the entire volume of the liquid when the vapor pressure equals the external pressure. This only happens at the substance's specific boiling point temperature under constant pressure conditions in physics.

149. (A) P-III, Q-I, R-IV, S-II
Several devices operate on fundamental fluid principles. A lactometer uses Archimedes' principle to measure milk density. Hydraulic lifts utilize Pascal's law to transmit and multiply force through an enclosed liquid. Parachutes rely on fluid friction, or air drag, to slow down a descent. Sprayers and atomizers function according to Bernoulli's principle, where high-speed air creates low pressure to draw and mist the liquid.

150. (A) Tangentially to the circular path
An object in circular motion is constantly being accelerated toward the center by a centripetal force. Its instantaneous velocity is always tangent to the circle. If the string provides the centripetal force and it suddenly breaks, there is no longer a force to change the object's direction. Due to inertia, the stone will continue moving in its last direction, which is tangentially to the path.

151. (A) Both A and R are true and R is the correct explanation of A.
A hydraulic press works based on Pascal's law, which states that pressure applied to an enclosed fluid is transmitted equally in all directions. Since pressure is force divided by area, the same pressure acting on a larger piston area creates a much larger output force. This allows a relatively small effort on a small piston to lift a much heavier load on a larger one.

152. (B) The ratio of load moved to effort applied.
Mechanical advantage is a measure of the force-amplification achieved by using a tool, mechanical device, or machine system. It is defined as the ratio of the output force (load) to the input force (effort). A machine with a mechanical advantage greater than one allows a person to lift a heavy weight by applying a smaller force over a longer distance.

Downloaded from www.pdf.tube

153. (C) Constant acceleration - Velocity changes by equal amounts in equal intervals of time
Acceleration is defined as the rate of change of velocity. If an object has constant acceleration, its velocity will increase or decrease by the same amount during every second of its motion. Uniform velocity means both speed and direction are constant, and retardation is specifically a negative acceleration. Displacement is the change in position, which is different from the total path length traveled.

154. (A) I, II, III and IV only
Bose-Einstein Condensate is the fifth state of matter, formed by cooling very low-density gases to near absolute zero. At these extreme temperatures, atoms merge into a single quantum state and lose their individual identities. This phenomenon was predicted by Satyendra Nath Bose and Albert Einstein. It does not exist naturally at room temperature because the required thermal conditions are extremely low and specific.

155. (A) I, II, III, IV
To find the relative density of a liquid using a specific gravity bottle, one must first weigh the clean, empty bottle. The bottle is then filled with the liquid and weighed, followed by a separate measurement while filled with water. By subtracting the bottle's mass, one finds the mass of equal volumes of both fluids. The ratio of these masses gives the liquid's relative density.

156. (B) Inertia of motion
Inertia of motion is the inherent property of a body to resist any change in its state of uniform motion. When an athlete crosses the finish line, their body tends to maintain its high velocity. Stopping suddenly would require a massive external force, so the athlete must gradually decelerate to overcome this inertia and safely bring their momentum to zero over a longer distance.

157. (B) II and III only
Newton's third law states that forces always exist in equal and opposite pairs acting on different bodies, such as a book and a table. Critically, these forces do not require physical contact, as seen with gravitational or magnetic attractions. Therefore, the statement that it applies only during contact is incorrect. The law explains how objects interact through forces that are balanced in magnitude but opposite in direction.

158. (A) The torque
Torque is the rotational equivalent of linear force and is calculated as the product of the force applied and the length of the lever arm. By using a longer spanner, a mechanic increases the distance from the axis of rotation to the point where the force is applied. This increased lever arm produces a much larger torque, making it easier to rotate and loosen the nut.

NODIA

159. (A) P-II, Q-I, R-IV, S-III
Many common experiences involve specific physical properties. A needle floats on water due to surface tension. A syringe draws liquid because of the pressure difference created by moving the plunger. A broom acts as a Class III lever where the effort is applied between the fulcrum and the load. Shock absorbers in vehicles use elasticity and damping to absorb energy from road bumps for stability.

160. (D) Velocity is non-zero (horizontal), acceleration is downward (gravity).
At the peak of its trajectory, a ball hit at an angle still possesses its original horizontal velocity, as there is no horizontal acceleration. However, the vertical component of its velocity becomes zero at the highest point. Throughout the entire flight, the ball is subject to the constant downward acceleration of gravity, which remains approximately nine point eight metres per second squared regardless of the ball's position.

www.nodia.in

CHAPTER 04

Electricity, Magnetism, Light and Sound

1. Match the following electrical quantities with their SI units:
List I: (Electrical Quantities)
P. Electric Charge
Q. Potential Difference
R. Electrical Resistance
S. Electric Power
List II: (SI Units)
I. Watt
II. Ohm
III. Volt
IV. Coulomb
(A) P-IV, Q-III, R-II, S-I
(B) P-IV, Q-II, R-III, S-I
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

2. Which of the following best defines electric potential at a point in an electric field?
(A) The total rate of flow of electric charges across a given cross-section in a closed circuit.
(B) The intrinsic opposition offered by a conductor to the flow of electrons under an applied field.
(C) Work done per unit positive charge to move it from infinity to that specific point.
(D) The product of electric current and total resistance in a linear conductor at constant temperature.
(E) Answer not known

3. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The electrostatic force between two point charges decreases when they are placed in water compared to vacuum.
Reason (R): Water has a higher relative permittivity (dielectric constant) than free space, which reduces the effective force between the charges.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

4. What is the approximate value of the elementary charge of an electron?
(A) 1.6×10^{19} C
(B) 9.1×10^{-31} C
(C) 6.25×10^{18} C
(D) 1.6×10^{-19} C
(E) Answer not known

5. Identify the correctly matched pair of electrical device and its primary function:
(A) Voltmeter - Measures the magnitude of electric current in a series connection
(B) Galvanometer - Detects the presence and direction of small currents
(C) Ammeter - Measures the potential difference across a load in a parallel branch
(D) Rheostat - Converts mechanical energy into electrical energy using magnetic induction
(E) Answer not known

6. Consider the following statements regarding electric field lines:
I. They originate from positive charges and terminate at negative charges.
II. Two electric field lines can intersect each other at a neutral point.
III. They always form closed continuous loops.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I
(D) III
(E) Answer not known

Click Here to Buy book on Amazon

7. Which of the following statements is correct regarding Ohm's law?
(A) It is a fundamental rule applicable to all conducting materials including active semiconductors.
(B) It states that electric current is always inversely proportional to the applied potential difference.
(C) It is a universal physical law that applies to all states of matter under any external condition.
(D) It is valid only when temperature and other physical parameters of the conductor stay constant.
(E) Answer not known

8. Which of the following represents the correct ascending order of electrical resistivity at room temperature?
(A) Silver < Copper < Nichrome < Glass
(B) Copper < Silver < Glass < Nichrome
(C) Glass < Nichrome < Copper < Silver
(D) Silver < Nichrome < Copper < Glass
(E) Answer not known

9. Identify the incorrect statement regarding Alternating Current (AC) and Direct Current (DC):
(A) Alternating current can be easily stepped up or stepped down using a standard electrical transformer.
(B) Long-distance AC transmission suffers higher power loss compared to low-voltage DC methods.
(C) The frequency of DC is exactly zero, whereas the standard AC supply frequency in India is 50 Hz.
(D) Direct current is primarily used in specialized processes like electroplating and battery charging.
(E) Answer not known

10. Match the following laws with their corresponding mathematical expressions:
List I: (Laws)
P. Ohm's Law
Q. Joule's Law of Heating
R. Coulomb's Law
S. Power formula
List II: (Expressions)
I. $H = I^2Rt$
II. $F = k(q_1q_2)/r^2$
III. $P = VI$
IV. $V = IR$
(A) P-IV, Q-I, R-II, S-III
(B) P-IV, Q-III, R-II, S-I
(C) P-II, Q-I, R-IV, S-III
(D) P-III, Q-I, R-II, S-IV
(E) Answer not known

11. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): In domestic electrical wiring, appliances are connected in parallel rather than in series.
Reason (R): Parallel connection ensures that the overall resistance of the circuit increases, minimizing power consumption.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

12. If a uniform wire of resistance R is stretched to twice its original length without changing its volume, what will be its new resistance?
(A) R/2
(B) 2R
(C) 4R
(D) R/4
(E) Answer not known

13. Identify the incorrectly matched pair regarding factors affecting resistance:
(A) Length of conductor - Directly proportional to resistance
(B) Area of cross-section - Inversely proportional to resistance
(C) Nature of material - Determines resistivity
(D) Temperature in metals - Inversely proportional to resistance
(E) Answer not known

14. Consider the following statements about series and parallel circuits:
I. In a series circuit, the current remains constant across all resistors.

NODIA

II. In a parallel circuit, the potential difference varies across different resistors.
III. The equivalent resistance in a parallel circuit is less than the smallest individual resistance.
IV. If one appliance fails in a series circuit, all other appliances stop working.

Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II and IV
(D) I and III
(E) Answer not known

15. Which of the following is the characteristic feature of an ideal voltmeter?
(A) It has zero internal resistance to facilitate maximum possible current flow.
(B) It has infinite resistance to avoid drawing current from the circuit.
(C) It is always connected in a series configuration with the measured component.
(D) It actively dissipates thermal energy according to the principles of Joule's law.
(E) Answer not known

16. Arrange the following steps of domestic power supply distribution in the correct sequential order from the main source:
I. Distribution Board (Main Switch)
II. Electric Meter
III. Pole / Service Mains
IV. Individual Appliance Circuits
(A) III, II, I, IV
(B) II, III, I, IV
(C) III, I, II, IV
(D) I, II, III, IV
(E) Answer not known

17. Based on Joule's law of heating, if the current passing through a resistor is doubled while keeping the resistance and time constant, the heat produced will:
(A) Increase by four times
(B) Remain the same
(C) Double
(D) Halve
(E) Answer not known

18. Consider the following statements about capacitors:
I. A capacitor stores electrical energy in the form of an electric field.
II. Its capacitance is measured in Farads.
III. Capacitance increases if a dielectric medium is introduced between the plates.
IV. In a DC circuit, a fully charged capacitor acts as a short circuit.
V. They are used to tune frequencies in radio circuits.

Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, II and IV
(D) I, III and V
(E) Answer not known

19. Which of the following materials is most relevant for making a fuse wire in a domestic circuit?
(A) High resistance and low melting point
(B) High resistance and high melting point
(C) Low resistance and high melting point
(D) Low resistance and low melting point
(E) Answer not known

20. Which of the following devices does NOT work primarily on the principle of the heating effect of electric current?
(A) Electric Iron
(B) Electric Toaster
(C) Electric Fuse
(D) Miniature Circuit Breaker (MCB)
(E) Answer not known

21. Match the following terms in magnetism with their correct definitions:
List I: (Terms)
P. Magnetic Declination
Q. Magnetic Dip
R. Magnetic Flux
S. Magnetic Field Intensity
List II: (Definitions)
I. Number of field lines crossing a given area
II. Angle between geographic and magnetic meridians
III. Force experienced by a unit north pole
IV. Angle made by earth's total magnetic field with the horizontal
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-I, S-III
(C) P-II, Q-I, R-IV, S-III

Downloaded from www.pdf.tube

(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

22. Which of the following best defines the term 'Curie temperature'?
(A) The specific temperature at which a superconductor loses all its electrical resistance.
(B) The temperature point at which water achieves its absolute maximum volumetric density.
(C) The temperature above which a ferromagnetic material becomes paramagnetic.
(D) The temperature at which a permanent magnet acquires its theoretical maximum strength.
(E) Answer not known

23. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The magnetic poles of the Earth do not coincide exactly with its geographic poles.
Reason (R): The Earth's magnetic field is generated by convective currents of molten iron in the Earth's outer core, which continuously shifts.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

24. What is the value of the angle of dip at the Earth's magnetic equator?
(A) 0 degrees
(B) 90 degrees
(C) 45 degrees
(D) 180 degrees
(E) Answer not known

25. Identify the correctly matched pair of rule and its application:
(A) Fleming's left-hand rule - Direction of induced current in a generator
(B) Maxwell's right-hand grip rule - Direction of magnetic field around a straight current-carrying conductor
(C) Fleming's right-hand rule - Direction of force on a current-carrying conductor in a magnetic field
(D) Lenz's law - Magnitude of force between two magnetic poles
(E) Answer not known

NODIA

26. Consider the following statements regarding magnetic field lines:
I. They emerge from the South pole and merge at the North pole outside the magnet.
II. The degree of closeness of the field lines indicates the relative strength of the magnetic field.
III. Magnetic field lines never intersect each other.
Which of the above statement(s) is/are incorrect?
(A) I and II
(B) II and III
(C) I
(D) III
(E) Answer not known

27. Which of the following statements correctly describes Lenz's Law?
(A) Induced current direction opposes the flux change producing it, conserving energy.
(B) The induced current always flows in a specific direction that aids the magnetic change producing it.
(C) The induced electromotive force is directly proportional to the rate of change of magnetic flux.
(D) The magnetic field induced by a current-carrying loop is always parallel to the plane of the loop.
(E) Answer not known

28. Which of the following represents the correct sequence of electromagnetic waves in increasing order of their frequency?
(A) Radio waves, Microwaves, Visible light, X-rays
(B) X-rays, Visible light, Microwaves, Radio waves
(C) Microwaves, Radio waves, X-rays, Visible light
(D) Visible light, Microwaves, Radio waves, X-rays
(E) Answer not known

29. Identify the incorrect statement regarding a Transformer:
(A) It works on the principle of mutual induction.
(B) It can step up or step down alternating voltage.
(C) In a step-up transformer, the number of turns in the secondary coil is greater than in the primary coil.
(D) It can be used to alter the voltage of direct current (DC) effectively.
(E) Answer not known

30. Match the components of the electromagnetic spectrum with their typical applications:
List I: (Components)
P. Infrared rays
Q. Ultraviolet rays
R. Gamma rays
S. Microwaves
List II: (Applications)
I. Radar systems
II. Cancer tumor treatment
III. Night vision cameras
IV. Sterilization of surgical instruments
(A) P-III, Q-IV, R-II, S-I
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-I, R-IV, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

31. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The core of a transformer is usually laminated.
Reason (R): Lamination increases the eddy currents, thereby enhancing the overall efficiency of the transformer.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

32. What is the fundamental principle behind the working of an electric generator?
(A) Heating effect of electric current
(B) Force on a current-carrying conductor in a magnetic field
(C) Chemical effect of electric current
(D) Electromagnetic induction
(E) Answer not known

33. Identify the incorrectly matched pair regarding electromagnet components:
(A) soft iron core - Increases the magnetic strength
(B) Insulated copper wire - Carries electric current to create the field
(C) Switch - Controls the flow of current
(D) Battery - Provides alternating current to maintain polarity
(E) Answer not known

34. Consider the following statements about an electric motor:
I. It converts electrical energy into mechanical energy.
II. It works on the principle of electromagnetic induction.
III. The split ring acts as a commutator to reverse the current direction in the coil.
IV. Fleming's left-hand rule is used to find the direction of force on its coil.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) I, III and IV
(C) I and IV
(D) II
(E) Answer not known

35. Which of the following features accurately distinguishes an AC generator from a DC generator?
(A) An AC generator employs slip rings, whereas a DC generator uses a split-ring commutator.
(B) An AC generator uses a strong permanent magnet, while a DC generator uses an electromagnet.
(C) An AC generator does not require an armature coil to induce current through rotation.
(D) An AC generator operates purely on the principle of mutual induction between two coils.
(E) Answer not known

Click Here to Buy book on Amazon

36. Arrange the following materials in the correct order of their suitability for making permanent magnets (from least suitable to most suitable):
I. Soft iron
II. Alnico
III. Wood
IV. Steel
(A) III, I, IV, II
(B) I, III, II, IV
(C) III, I, II, IV
(D) I, IV, II, III
(E) Answer not known

37. If a step-down transformer reduces voltage from 220V to 11V and the primary coil has 2000 turns, what is the number of turns in the secondary coil?
(A) 200 turns
(B) 100 turns
(C) 50 turns
(D) 10 turns
(E) Answer not known

38. Consider the following statements about Faraday's laws of electromagnetic induction:
I. An EMF is induced in a coil whenever the magnetic flux linked with it changes.
II. The magnitude of induced EMF is inversely proportional to the rate of change of magnetic flux.
III. An induced current will flow only if the circuit is closed.
IV. It applies only to constant magnetic fields.
V. The phenomenon was discovered simultaneously by Michael Faraday and Joseph Henry.
Which of the above statement(s) is/are incorrect?
(A) I, III, IV and V
(B) I, II, III and V
(C) II and IV
(D) I, III and V
(E) Answer not known

39. Which of the following elements is most relevant in protecting a sensitive magnetic instrument from external magnetic fields?
(A) Placing it inside a copper box
(B) Grounding the instrument
(C) Placing a permanent magnet nearby
(D) Placing it inside a soft iron enclosure (magnetic shielding)
(E) Answer not known

40. Which of the following is an exception to the applications of electromagnets?
(A) Traditional magnetic compass needle
(B) Electric bells
(C) Magnetic Levitation (Maglev) trains
(D) Cranes for lifting heavy scrap iron
(E) Answer not known

41. Match the following optical phenomena with their real-world examples:
List I: (Phenomena)
P. Total Internal Reflection
Q. Dispersion
R. Scattering
S. Refraction
List II: (Examples)
I. Twinkling of stars
II. Blue color of the sky
III. Formation of a rainbow spectrum
IV. Brilliance of a diamond
(A) P-IV, Q-III, R-II, S-I
(B) P-III, Q-IV, R-I, S-II
(C) P-IV, Q-II, R-III, S-I
(D) P-I, Q-III, R-II, S-IV
(E) Answer not known

42. Which of the following is the standard definition of the absolute refractive index of a medium?
(A) Ratio of the speed of light in a vacuum to its speed within the specific medium.
(B) The ratio of the angle of incidence to the angle of refraction in a dense medium.
(C) The ratio of the speed of light in the medium to the speed of light in vacuum.
(D) The product of the critical angle and the angle of incidence for a given light ray.
(E) Answer not known

43. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Optical fibres transmit light signals over long distances with virtually no loss of energy.
Reason (R): The light beam continuously undergoes total internal reflection inside the core of the optical fibre.
(A) Both A and R are true and R is the correct

Downloaded from www.pdf.tube

explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

44. What is the approximate speed of light in a vacuum, a constant fundamental to physics?
(A) 3×10^8 km/s
(B) 3×10^5 m/s
(C) 3×10^8 m/s
(D) 3×10^{10} m/s
(E) Answer not known

45. Identify the correctly matched pair regarding types of mirrors and their uses:
(A) Plane mirror - Used as a rear-view mirror in vehicles to get a wider field of view
(B) Convex mirror - Used as shaving mirrors to get an enlarged image
(C) Parabolic mirror - Used to diverge light beams in street lamps
(D) Concave mirror - Used in solar furnaces to concentrate sunlight
(E) Answer not known

46. Consider the following statements regarding the laws of reflection:
I. The angle of incidence is always equal to the angle of reflection.
II. The incident ray, the reflected ray, and the normal at the point of incidence all lie in the same plane.
III. The laws of reflection are valid only for smooth, polished surfaces and fail for rough surfaces.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I
(D) III
(E) Answer not known

47. Which of the following statements correctly describes the image formed by a convex lens when the object is placed between the optical centre and the principal focus (F1)?
(A) Real, inverted, and diminished
(B) Virtual, erect, and magnified
(C) Real, inverted, and same size
(D) Virtual, inverted, and diminished
(E) Answer not known

48. Which of the following sequences represents the correct descending order of refractive indices for these media?
(A) Diamond > Crown Glass > Water > Air
(B) Crown Glass > Diamond > Air > Water
(C) Diamond > Water > Crown Glass > Air
(D) Air > Water > Crown Glass > Diamond
(E) Answer not known

49. Identify the incorrect statement concerning the refraction of light:
(A) The speed of light increases when it enters a denser medium from a rarer medium.
(B) When light travels from a rarer to a denser medium, it bends towards the normal.
(C) The frequency of light remains unchanged during refraction.
(D) Snell's law states that the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant.
(E) Answer not known

NODIA

50. Match the vision defects with the corrective lenses used:
List I: (Vision Defects)
P. Myopia
Q. Hypermetropia
R. Presbyopia
S. Astigmatism
List II: (Corrective Lenses)
I. Convex lens
II. Cylindrical lens
III. Concave lens
IV. Bifocal lens
(A) P-III, Q-I, R-IV, S-II
(B) P-I, Q-III, R-II, S-IV
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

51. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The sun appears red during sunrise and sunset.
Reason (R): Red light has the longest wavelength in the visible spectrum and is

scattered the least by atmospheric particles.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

52. If a convex glass lens (refractive index 1.5) is immersed in water (refractive index 1.33), what happens to its focal length compared to when it is in air?
(A) It decreases
(B) It remains unchanged
(C) It becomes negative (acts as a concave lens)
(D) It increases
(E) Answer not known

53. Identify the incorrectly matched pair regarding the human eye:
(A) Iris - Regulates the amount of light entering the eye
(B) Blind spot - The area on the retina with the maximum concentration of light-sensitive cells
(C) Retina - Acts as a screen where the image is formed
(D) Ciliary muscles - Help change the focal length of the eye lens
(E) Answer not known

54. Consider the following characteristics of an image formed by a plane mirror:
I. It is always real and inverted.
II. It is laterally inverted.
III. It is formed at the same distance behind the mirror as the object is in front.
IV. It is magnified depending on the object's distance.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) I, III and IV
(C) I and IV
(D) II and III
(E) Answer not known

55. Which of the following features is a defining characteristic of Myopia (Short-sightedness)?
(A) The eyeball becomes too short, causing the image to form behind the retina.
(B) The focal length of the eye lens becomes too long for distant objects.
(C) The person cannot see nearby objects clearly with proper focus.
(D) Distant object images are formed in front of the retina.
(E) Answer not known

56. Arrange the following parts of the human eye in the correct sequential order as light passes through them:
I. Aqueous humour
II. Cornea
III. Pupil
IV. Lens
(A) II, I, III, IV
(B) II, III, I, IV
(C) III, II, I, IV
(D) I, II, III, IV
(E) Answer not known

57. If two thin lenses of power +3D and -1.5D are placed in contact, what is the power of the combination?
(A) +4.5D
(B) +1.5D
(C) -4.5D
(D) -1.5D
(E) Answer not known

58. Consider the following statements about dispersion of light by a glass prism:
I. Sir Isaac Newton was the first to use a glass prism to obtain the spectrum of sunlight.
II. Dispersion occurs because different colors of light travel at different speeds in glass.
III. Red light bends the most while passing through the prism.
IV. Violet light has the shortest wavelength in the visible spectrum.
V. Recombining the spectrum with an inverted identical prism produces white light.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V
(B) II, III, IV and V
(C) I, II and III
(D) I, IV and V
(E) Answer not known

Click Here to Buy book on Amazon

59. Which of the following principles is most relevant to the formation of a mirage in hot deserts?
(A) Total Internal Reflection
(B) Scattering of light
(C) Dispersion of light
(D) Interference of light
(E) Answer not known

60. Which of the following is an exception and NOT a result of atmospheric refraction?
(A) The apparent flattening of the sun's disc at sunrise and sunset
(B) The twinkling of stars
(C) The Tyndall effect observed in a dusty room
(D) The advanced sunrise and delayed sunset
(E) Answer not known

61. Match the following terms related to sound with their standard units:
List I: (Sound Terms)
P. Frequency
Q. Wavelength
R. Loudness
S. Speed of Sound
List II: (Standard Units)
I. Decibel (dB)
II. Hertz (Hz)
III. Metres per second (m/s)
IV. Metre (m)
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-I, S-III
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

62. Which of the following best defines the 'pitch' of a sound?
(A) It is the characteristic that distinguishes a loud sound from a faint one, depending on amplitude.
(B) It is the total linear distance travelled by a specific sound wave in one second.
(C) Characteristic determining sound shrillness based on vibration frequency.
(D) It is the property that distinguishes sounds of the same loudness produced by different instruments.
(E) Answer not known

63. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The speed of sound is generally greater in solids than in gases.
Reason (R): Solids possess higher elasticity and lower density than gases, which facilitates faster transmission of mechanical waves.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

64. What is the standard audible frequency range for a normal human ear?
(A) 2 Hz to 2,000 Hz
(B) 200 Hz to 20,000 Hz
(C) 20,000 Hz to 200,000 Hz
(D) 20 Hz to 20,000 Hz
(E) Answer not known

NODIA

65. Identify the correctly matched pair regarding types of waves:
(A) Ripples on water surface - Transverse mechanical waves
(B) Sound waves in air - Transverse mechanical waves
(C) Light waves - Longitudinal electromagnetic waves
(D) X-rays - Longitudinal mechanical waves
(E) Answer not known

66. Consider the following statements about factors affecting the speed of sound in air:
I. The speed of sound increases with an increase in temperature.
II. The speed of sound is directly proportional to atmospheric pressure at constant temperature.
III. Sound travels faster in humid air than in dry air.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

67. Which of the following statements accurately describes 'reverberation' in an auditorium?
(A) Persistent sound due to multiple reflections from interior surfaces.
(B) It is the sharp, single reflection of sound heard distinctly after the original sound.
(C) It is the bending of sound waves around obstacles in a wide hall.
(D) It is the complete absorption of sound waves by specially designed acoustic panels.
(E) Answer not known

68. Which of the following sequences represents the correct ascending order of the speed of sound in the given media at 25°C?
(A) Air < Water < Iron < Aluminium
(B) Air < Iron < Water < Aluminium
(C) Water < Air < Aluminium < Iron
(D) Aluminium < Iron < Water < Air
(E) Answer not known

69. Identify the incorrect application of ultrasound:
(A) Echocardiography to image the heart.
(B) Sterilization of drinking water by destroying bacteria directly through radiation.
(C) Detection of flaws and cracks in metal blocks.
(D) Breaking kidney stones into fine grains.
(E) Answer not known

70. Match the sensing technologies with the types of waves they utilize:
List I: (Sensing Technologies)
P. SONAR
Q. RADAR
R. LIDAR
S. Stethoscope
List II: (Types of Waves)
I. Multiple reflection of sound
II. Ultrasonic waves
III. Radio waves
IV. Laser (Light) pulses
(A) P-II, Q-III, R-IV, S-I
(B) P-III, Q-II, R-I, S-IV
(C) P-I, Q-IV, R-II, S-III
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

71. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Bats can navigate and catch prey in absolute darkness without hitting obstacles.
Reason (R): Bats produce high-frequency ultrasonic waves and use the principle of echolocation by listening to the reflected echoes.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

72. To hear a distinct echo, what must be the minimum distance between the source of sound and the reflecting surface at a normal room temperature (assuming speed of sound is 344 m/s)?
(A) 17.2 m
(B) 34.4 m
(C) 10.0 m
(D) 25.0 m
(E) Answer not known

73. Identify the incorrectly matched pair regarding noise levels and their typical sources:
(A) Normal breathing - 10 dB
(B) Busy city traffic - 30 dB
(C) Normal conversation - 60 dB
(D) Jet engine taking off - 140 dB
(E) Answer not known

74. Consider the following statements about sound waves:
I. Sound requires a material medium to propagate.
II. Sound waves are characterized by compressions and rarefactions in a medium.
III. The speed of sound is independent of the density of the medium.
IV. The loudness of sound is inversely proportional to its amplitude.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) I, II and IV
(C) II and III
(D) III and IV
(E) Answer not known

Downloaded from www.pdf.tube

75. Which of the following is a characteristic feature of infrasound?
(A) It is produced by earthquakes, elephants, and whales.
(B) Its frequency is above 20,000 Hz.
(C) It is extensively used in medical imaging techniques.
(D) It can be heard clearly by the adult human ear.
(E) Answer not known

76. Arrange the following parts of the human auditory system in the correct sequence of sound wave transmission:
I. Tympanic membrane (Eardrum)
II. Pinna
III. Cochlea
IV. Auditory ossicles (Hammer, Anvil, Stirrup)
(A) II, I, IV, III
(B) I, II, III, IV
(C) II, IV, I, III
(D) I, IV, II, III
(E) Answer not known

77. If the frequency of a sound wave is doubled while propagating in the same medium at a constant temperature, what is the effect on its wavelength?
(A) It doubles
(B) It remains unchanged
(C) It becomes four times
(D) It becomes half
(E) Answer not known

78. Consider the following statements regarding SONAR:
I. SONAR stands for Sound Navigation and Ranging.
II. It uses infrasonic waves to measure ocean depth.
III. It consists of a transmitter and a detector installed on a ship.
IV. The distance is calculated using the formula $2d = v \times t$.
V. It can be used to locate underwater hills and sunken ships.
Which of the above statement(s) is/are correct?
(A) I, III, IV and V
(B) I, II, IV and V
(C) II, III and IV
(D) I, II and V
(E) Answer not known

79. Which of the following measures is most relevant for minimizing reverberation in a modern cinema hall?
(A) Polishing the walls to a high shine
(B) Covering the walls and ceilings with sound-absorbent materials like compressed fibreboard
(C) Using highly sound-reflecting curved panels on the ceiling
(D) Increasing the number of windows and smooth glass surfaces
(E) Answer not known

80. Which of the following is an exception and NOT considered a general characteristic of a musical sound?
(A) Regular and periodic vibrations
(B) A well-defined pitch
(C) A continuous waveform without abrupt changes
(D) Sudden, high-intensity fluctuations in amplitude
(E) Answer not known

81. Match the following electrical circuit symbols with their standard representations:
List I: (Circuit Symbols)
P. Variable Resistance (Rheostat)
Q. A closed plug key
R. An electric bulb
S. Wires crossing without joining
List II: (Representations)
I. A wire with a semi-circular hump over another
II. A circle with a cross or filament symbol
III. A zigzag line with an arrow across it
IV. Brackets with a central dot (•)
(A) P-III, Q-IV, R-II, S-I
(B) P-IV, Q-III, R-I, S-II
(C) P-III, Q-II, R-IV, S-I
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

82. Which of the following best defines one kilowatt-hour (1 kWh)?
(A) The power consumed by an appliance of 1000 watts in one second.
(B) The potential difference required to drive 1000 amperes of current for one hour.

NODIA

(C) The electrical energy consumed by an appliance of 1000 watts operating for one hour.
(D) The charge transferred by 1000 coulombs in one hour.
(E) Answer not known

83. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The metallic body of high-power electrical appliances like geysers must be earthed.
Reason (R): Earthing provides a low-resistance path for electric current, preventing severe shocks in case of a leakage.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

84. What is the standard voltage and frequency of alternating current (AC) supplied for domestic use in India?
(A) 110 V, 60 Hz
(B) 240 V, 60 Hz
(C) 440 V, 50 Hz
(D) 220 V, 50 Hz
(E) Answer not known

85. Identify the correctly matched pair of material and its general electrical nature:
(A) Silicon - Superconductor
(B) Manganin - Alloy used for standard resistors
(C) Nichrome - Insulator
(D) Ebonite - Good conductor
(E) Answer not known

86. Consider the following statements regarding the equivalent capacitance:
I. When capacitors are connected in series, the equivalent capacitance decreases.
II. When capacitors are connected in parallel, the equivalent capacitance is the sum of individual capacitances.
III. In a series combination, the charge across each capacitor is different.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I
(D) III
(E) Answer not known

87. Which of the following statements correctly differentiates an MCB from a traditional electrical fuse?
(A) A fuse can be reused after blowing, whereas an MCB must be replaced.
(B) A fuse is much faster at detecting minor overloads than a modern MCB.
(C) An MCB handles only direct current, while a fuse handles alternating current.
(D) An MCB operates based on electromagnetism and trips during a fault, whereas a fuse melts due to heating.
(E) Answer not known

88. Three resistors of 2 Ω, 4 Ω, and 6 Ω are available. Which sequence correctly represents the arrangement types required to get the lowest to the highest equivalent resistance?
(A) All in parallel, Two in parallel with one in series, All in series
(B) All in series, Two in parallel with one in series, All in parallel
(C) All in parallel, All in series, Two in parallel with one in series
(D) All in series, All in parallel, Two in parallel with one in series
(E) Answer not known

89. Identify the incorrect statement regarding heating elements used in appliances like electric irons:
(A) They are usually made of alloys like nichrome.
(B) They oxidize rapidly at high temperatures.
(C) They have high resistivity compared to pure metals.
(D) They possess a high melting point.
(E) Answer not known

90. Match the scientists with their fundamental contributions to electromagnetism:
List I: (Scientists)
P. Hans Christian Oersted
Q. Michael Faraday

Click Here to Buy book on Amazon

R. Heinrich Hertz
S. Andre-Marie Ampere
List II: (Contributions)
I. Formulated laws of electrodynamics
II. Discovered electromagnetic induction
III. First demonstrated that electric current creates a magnetic field
IV. Proved the existence of electromagnetic waves
(A) P-III, Q-II, R-IV, S-I
(B) P-II, Q-III, R-I, S-IV
(C) P-III, Q-IV, R-II, S-I
(D) P-I, Q-II, R-IV, S-III
(E) Answer not known

91. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Tungsten is almost exclusively used for the filaments of incandescent lamps.
Reason (R): Tungsten has a very high melting point and retains its strength at extremely high temperatures.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

92. Two identical bulbs of 60W are connected in series to a 220V supply. What conceptual effect occurs compared to connecting them in parallel?
(A) They will consume exactly 120W of total power.
(B) Each bulb will glow with the same brightness as in parallel.
(C) The total power consumed will be less, and they will glow dimmer.
(D) The voltage across each bulb will remain 220V.
(E) Answer not known

93. Identify the incorrectly matched pair regarding the modern color coding of domestic wiring in India:
(A) Live wire - Red or Brown
(B) Neutral wire - Black or Blue
(C) Earth wire - Green or Yellow-Green
(D) Live wire - White
(E) Answer not known

94. Consider the following statements about Joule's law of heating ($H = I^2Rt$):
I. The heat produced is directly proportional to the square of the current.
II. The heat produced is inversely proportional to the resistance of the conductor.
III. The heat produced is directly proportional to the time for which current flows.
IV. The formula applies only to direct current, not alternating current.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) I, III and IV
(C) II and IV
(D) I and IV
(E) Answer not known

95. What is the fundamental feature required to convert a moving coil galvanometer into an ammeter?
(A) Connecting a high resistance in series
(B) Connecting a low resistance (shunt) in parallel
(C) Removing the soft iron core
(D) Increasing the number of turns in the coil infinitely
(E) Answer not known

96. Arrange the following stages of power generation and distribution in correct sequence from source to home:
I. Sub-station step-down transformer
II. Power plant generator
III. Step-up transformer for transmission
IV. Distribution pole transformer
(A) II, III, I, IV
(B) II, I, III, IV
(C) III, II, I, IV
(D) II, IV, I, III
(E) Answer not known

97. If the temperature of a standard metallic conductor (like copper) is increased, what is the inferred effect on its electrical resistance?
(A) Resistance increases due to more frequent collisions between free electrons and vibrating metal ions.
(B) Resistance decreases due to increased

NODIA

electron mobility.
(C) Resistance remains entirely unchanged.
(D) The metal turns into a superpower.
(E) Answer not known

98. Consider the following statements about electrical properties:
I. Resistance is the property of a conductor to resist the flow of charges.
II. The unit of resistance is Ohm (Ω).
III. Ohm's law fails at very high temperatures due to changing resistance.
IV. A semiconductor diode is a non-ohmic device.
V. Insulators have zero resistance at room temperature.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, II and V
(D) I, IV and V
(E) Answer not known

99. What is the most relevant function of a split-ring commutator in a DC motor?
(A) To reverse the direction of current in the armature coil every half rotation.
(B) To increase the magnitude of the current.
(C) To step down the voltage of the incoming DC supply.
(D) To provide an external magnetic field.
(E) Answer not known

100. Which of the following is an exception to the materials that generally obey Ohm's law (Ohmic conductors)?
(A) Copper wire
(B) Aluminum rod
(C) Silver strip
(D) Light Emitting Diode (LED)
(E) Answer not known

101. Match the following electromagnetic wave regions with their typical frequency ranges or wavelengths:
List I: (EM Wave Regions)
P. Radio waves
Q. Visible light
R. X-rays
S. Infrared
List II: (Ranges)
I. ~ 400 nm to 700 nm
II. > 1 mm
III. 700 nm to 1 mm
IV. 0.01 nm to 10 nm
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-III, R-IV, S-I
(D) P-III, Q-I, R-II, S-IV
(E) Answer not known

102. Which of the following best defines the 'Angle of Dip' (Inclination) at a particular place on Earth?
(A) The angle between the magnetic meridian and the geographic meridian at that place.
(B) The angle at which a compass needle points away from true north.
(C) The angle made by the Earth's total magnetic field vector with the horizontal plane.
(D) The total flux density of the Earth's magnetic field at the equator.
(E) Answer not known

103. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A magnetic compass needle cannot be used to find directions exactly at the Earth's magnetic North Pole.
Reason (R): At the magnetic poles, the Earth's magnetic field lines are perfectly vertical, making the horizontal component zero.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

104. In a vacuum, the velocity of all electromagnetic waves is exactly equal to:
(A) The velocity of light
(B) The velocity of sound in air
(C) The escape velocity of Earth
(D) The drift velocity of electrons
(E) Answer not known

105. Identify the correctly matched pair of optical phenomenon and its practical manifestation:
(A) Scattering - Formation of rainbow

NODIA

(B) Total Internal Reflection - Looming in cold regions
(C) Refraction - The blue colour of the ocean
(D) Dispersion - Apparent depth of a swimming pool
(E) Answer not known

106. Consider the following conditions for Total Internal Reflection (TIR) to occur:
I. Light must travel from a denser medium to a rarer medium.
II. The angle of incidence must be greater than the critical angle.
III. The refractive index of the first medium must be lower than the second medium.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I
(D) III
(E) Answer not known

107. Which of the following statements correctly describes the 'Power of Accommodation' of the human eye?
(A) Ability of the eye lens to adjust focal length for clear near and far vision.
(B) It is the ability of the cornea to change its curvature dynamically.
(C) It is the maximum intensity of light the retina can withstand.
(D) It is the process by which the pupil expands in dim light.
(E) Answer not known

108. Which of the following correctly orders the colours of the visible spectrum in increasing order of their wavelengths?
(A) Red, Yellow, Green, Violet
(B) Violet, Blue, Yellow, Red
(C) Red, Green, Blue, Violet
(D) Violet, Red, Green, Blue
(E) Answer not known

109. Identify the incorrect statement regarding a simple microscope:
(A) It consists of a single convex lens of short focal length.
(B) The object must be placed between the optical centre and the principal focus.
(C) The image formed is virtual, erect, and magnified.
(D) The magnifying power is highest when the image is formed at infinity.
(E) Answer not known

110. Match the types of optical telescopes with their defining objective components:
List I: (Telescope Types)
P. Galilean Telescope
Q. Astronomical Refracting Telescope
R. Newtonian Reflecting Telescope
S. Cassegrain Telescope
List II: (Objective Components)
I. Concave primary mirror and flat secondary mirror
II. Convex objective lens and concave eyepiece
III. Concave primary mirror and convex secondary mirror
IV. Convex objective lens and convex eyepiece
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-I, S-III
(C) P-I, Q-IV, R-II, S-III
(D) P-II, Q-III, R-I, S-IV
(E) Answer not known

111. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Dentists use concave mirrors to examine the teeth of a patient.
Reason (R): When an object is placed very close to a concave mirror, it forms a real, inverted, and magnified image.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

112. When a ray of light passes obliquely through a rectangular glass slab, what is the conceptual relationship between the incident ray and the emergent ray?
(A) They intersect each other at an acute angle.
(B) They are perpendicular to each other.
(C) The emergent ray undergoes total internal reflection back into the air.
(D) The emergent ray is perfectly parallel to the

Downloaded from www.pdf.tube

incident ray but laterally displaced.
(E) Answer not known

113. Identify the incorrectly matched pair regarding types of scattering:
(A) Raman scattering - Complete absorption of light without any change in wavelength
(B) Rayleigh scattering - Scattering by particles much smaller than the wavelength of light
(C) Mie scattering - Scattering by particles roughly equal to the wavelength of light (like dust/water droplets)
(D) Tyndall effect - Scattering of light by colloidal particles
(E) Answer not known

114. Consider the following statements about Electromagnetic (EM) waves:
I. They do not require any material medium for propagation.
II. They are longitudinal waves in nature.
III. They carry energy and momentum.
IV. The electric and magnetic fields oscillate parallel to each other.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) II, III and IV
(C) II and IV
(D) I and III
(E) Answer not known

115. What is the prominent feature of Astigmatism as a defect of vision?
(A) Blurred vision in one specific plane due to irregular curvature of the cornea.
(B) Inability to focus on both near and distant objects simultaneously due to age.
(C) Opacity of the crystalline lens causing complete blindness.
(D) Loss of color vision due to missing cone cells.
(E) Answer not known

116. Arrange the sequence of steps involved in forming an image in a basic photographic camera:
I. Light passes through the aperture controlled by the diaphragm.
II. The shutter opens to expose the film/sensor.
III. Light reflects off the object and enters the camera lens.
IV. A real and inverted image is captured on the film/sensor.
(A) III, I, II, IV
(B) I, III, II, IV
(C) III, II, I, IV
(D) II, I, III, IV
(E) Answer not known

117. If a spherical mirror has a radius of curvature of -20 cm, what is logically inferred about its focal length and type?
(A) f = +10 cm, Convex mirror
(B) f = –10 cm, Concave mirror
(C) f = –40 cm, Concave mirror
(D) f = +40 cm, Convex mirror
(E) Answer not known

118. Consider the following statements about the laws of refraction:
I. The incident ray, the refracted ray and the normal all lie in the same plane.
II. The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant.
III. This constant is called the relative refractive index of the second medium with respect to the first.
IV. Refraction is caused by the change in speed of light as it moves between media.
V. The wavelength of light remains constant during refraction.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, II and V
(D) I, IV and V
(E) Answer not known

119. Which of the following is the primary relevant reason for using a convex mirror as a rear-view mirror in vehicles?
(A) It forms a real and inverted image of distant objects.
(B) It magnifies the objects, making them easier to see.
(C) It does not suffer from spherical aberration.
(D) It forms a virtual, erect, and diminished image, providing a wider field of view.
(E) Answer not known

NODIA

120. Which of the following is an exception and NOT a primary application of Ultraviolet (UV) radiation?
(A) Remote control of television sets
(B) Forensic investigations for detecting forged documents
(C) Water purification through destroying bacterial DNA
(D) Sterilization of surgical equipment
(E) Answer not known

121. Match the following acoustic phenomena with their key characteristics:
List I: (Acoustic Phenomena)
P. Echo
Q. Reverberation
R. Resonance
S. Doppler Effect (General wave context)
List II: (Characteristics)
I. Sustained sound due to multiple reflections
II. Reflection of sound heard distinctly
III. Apparent change in frequency due to relative motion
IV. Drastic increase in amplitude when natural frequency matches forced frequency
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-I, Q-III, R-II, S-IV
(E) Answer not known

122. Which of the following defines the 'quality' or 'timbre' of a sound?
(A) The measure of acoustic energy crossing a unit area per second.
(B) The characteristic that distinguishes two sounds of the same pitch and loudness produced by different sources.
(C) The physical sensation of sound intensity on the human ear.
(D) The inverse of the time period of the sound wave.
(E) Answer not known

123. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Sound travels faster in moist air than in dry air at the same temperature.
Reason (R): The presence of moisture (water vapour) decreases the density of air compared to dry air, leading to an increase in the speed of sound.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

124. According to the World Health Organization (WHO), what is the maximum safe noise level fixed for a residential area during the daytime?
(A) 45 dB
(B) 75 dB
(C) 55 dB
(D) 85 dB
(E) Answer not known

125. Identify the correctly matched pair of sound device and its underlying principle:
(A) Megaphone - Refraction of sound
(B) Hearing aid - Dispersion of sound
(C) Flute - Total internal reflection of sound
(D) Stethoscope - Multiple reflection of sound
(E) Answer not known

126. Consider the following statements about mechanical waves:
I. They require a material medium for their propagation.
II. Transverse waves can propagate easily through the interior of gases.
III. Longitudinal waves can propagate through solids, liquids, and gases.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

127. Which of the following statements correctly distinguishes longitudinal waves from transverse waves?
(A) Longitudinal waves cannot travel through liquids, whereas transverse waves can.
(B) Particle oscillation is parallel to propagation in longitudinal waves, and perpendicular in transverse.

Click Here to Buy book on Amazon

(C) Longitudinal waves consist of crests and troughs, while transverse waves consist of compressions and rarefactions.
(D) Longitudinal waves are electromagnetic, while transverse waves are purely mechanical.
(E) Answer not known

128. Which of the following correctly represents the ascending order of hearing frequency thresholds for these organisms?
(A) Elephant < Human < Dog < Bat
(B) Human < Elephant < Bat < Dog
(C) Bat < Dog < Human < Elephant
(D) Elephant < Bat < Human < Dog
(E) Answer not known

129. Identify the incorrect statement regarding the applications of ultrasound:
(A) It is heavily utilized in radio broadcasting to carry audio signals.
(B) It is used to clean spiral tubes and odd-shaped electronic components.
(C) It is used in ultrasonography for examining internal organs like the liver and uterus.
(D) It is used in echocardiography to study heart valves.
(E) Answer not known

130. Match the environmental noise levels with their associated physical impact:
List I: (Noise Levels)
P. 30 dB
Q. 60 dB
R. 90 dB
S. 140 dB
List II: (Physical Impact)
I. Threshold of pain (physical damage)
II. Normal conversational level
III. Quiet whisper in a library
IV. Hearing damage with prolonged exposure
(A) P-III, Q-II, R-IV, S-I
(B) P-IV, Q-II, R-I, S-III
(C) P-III, Q-I, R-IV, S-II
(D) P-II, Q-III, R-I, S-IV
(E) Answer not known

131. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.

Assertion (A): Heavy curtains and soft carpets are heavily used in the construction of concert halls.
Reason (R): These materials act as good sound absorbers and help in reducing excessive reverberation.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

132. A ship sends out an ultrasound signal that returns from the seabed in 4 seconds. If the speed of sound in seawater is 1500 m/s, what is the depth of the seabed?
(A) 6000 m
(B) 1500 m
(C) 750 m
(D) 3000 m
(E) Answer not known

133. Identify the incorrectly matched pair of a sound wave property and its human perception:
(A) Frequency - Pitch
(B) Phase - Speed of sound
(C) Amplitude - Loudness
(D) Waveform complexity - Quality (Timbre)
(E) Answer not known

134. Consider the following measures to control noise pollution:
I. Planting trees along roadsides to act as noise buffers.
II. Constructing soundproof rooms using porous materials.
III. Promoting the removal of silencers from industrial exhaust pipes.
IV. Increasing the acoustic reflection of industrial machinery walls.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) I, III and IV
(C) III and IV
(D) I and II
(E) Answer not known

NODIA

ANSWERS

1. (A) P-IV, Q-III, R-II, S-I
Standard SI units are used to measure different physical quantities in electrical circuits. Electric charge is measured in coulombs, representing the total quantity of electricity. Potential difference is measured in volts, indicating the electrical pressure. Resistance uses ohms to quantify the opposition to current flow. Finally, electric power is expressed in watts, representing the rate of energy consumption.

2. (C) Work done per unit positive charge to move it from infinity to that specific point.
Electric potential at a specific point in an electric field is defined as the amount of work required to move a unit positive test charge from a reference point, usually infinity, to that specific point. It represents the potential energy per unit charge at that location and is a scalar quantity measured in the SI unit of volts.

3. (A) Both A and R are true and R is the correct explanation of A.
According to Coulomb's law, the electrostatic force between two point charges is inversely proportional to the permittivity of the medium. Water possesses a very high relative permittivity, also known as its dielectric constant, compared to a vacuum. Consequently, when charges are placed in water, the effective electrostatic force between them is significantly reduced compared to their force in vacuum.

4. (D) 1.6×10^{-19} C
The elementary charge is a fundamental physical constant representing the smallest unit of electric charge that exists independently in nature. An electron carries a negative charge with a magnitude of approximately 1.6×10^{-19} Coulombs. This precise value is essential for calculations involving the quantization of charge, atomic structure, and the behavior of subatomic particles in electromagnetic fields.

5. (B) Galvanometer - Detects the presence and direction of small currents
A galvanometer is a sensitive instrument specifically designed to detect the presence and the direction of small electric currents within a circuit. While ammeters and voltmeters are used to measure the magnitude of current and potential difference respectively, the galvanometer serves as a vital tool for identifying the existence of current flow in various experimental and practical applications.

6. (C) I
Electric field lines are imaginary lines used to represent the direction and strength of an electric field. They strictly originate from positive charges and terminate at negative charges. Unlike magnetic field lines, they do not form closed loops. Furthermore, two electric field lines can never intersect each other because the electric field at any point has a unique direction.

7. (D) It is valid only when temperature and other physical parameters of the conductor stay constant.
Ohm's law states that the current flowing through a conductor is directly proportional to the potential difference across it. However, this relationship holds true only if the physical conditions of the conductor, such as its temperature, length, and material composition, remain constant. Many materials, including semiconductors and electrolytes, are non-ohmic and do not strictly follow this linear relationship.

8. (A) Silver < Copper < Nichrome < Glass
Electrical resistivity is an intrinsic property that determines how strongly a material opposes the flow of electric current. Silver and copper are excellent conductors with extremely low resistivity values. Nichrome, being an alloy, has a much higher resistivity and is used in heating elements. Glass is a potent insulator, possessing the highest resistivity among these common materials at room temperature.

Downloaded from www.pdf.tube

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

North and South magnetic poles.
(E) Answer not known

143. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A transformer can step up or step down voltage, but it cannot change the frequency of the alternating current.
Reason (R): The principle of mutual induction transfers energy from the primary to the secondary coil at the same rate of flux alternation.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

144. What is the standard value of the least distance of distinct vision for a normal young adult?
(A) 25 mm
(B) 2.5 m
(C) Infinity
(D) 25 cm
(E) Answer not known

145. Identify the correctly matched pair regarding the human eye:
(A) Optic nerve - Transmits electrical signals from the retina to the brain
(B) Cornea - The tough white outer protective layer of the eye
(C) Pupil - A sensitive screen at the back of the eye
(D) Sclera - The clear front window of the eye that refracts light
(E) Answer not known

146. Consider the following statements regarding the working of an AC generator:
I. The armature coil is mechanically rotated in a strong magnetic field.
II. As the coil rotates, the magnetic flux passing through it continuously changes, inducing an EMF.
III. The slip rings ensure that the output current flows only in one direction continuously.
Which of the above statement(s) is/are incorrect?
(A) I and II
(B) II and III
(C) III
(D) I
(E) Answer not known

147. Which of the following statements correctly identifies a key application of electromagnetic induction?
(A) It is the fundamental principle used in induction stoves and transformers.
(B) It is the principle behind the working of electric irons.
(C) It is used in the manufacturing of optical fibres.
(D) It is utilized exclusively for generating direct current in chemical batteries.
(E) Answer not known

148. Which sequence correctly describes the protective action of a lightning conductor on a building?
I. Static charge buildup on clouds → Induction of opposite charge on conductor spikes → Safe discharge to earth via copper strip → Neutralization.
(A) Static charge buildup on clouds → Induction of opposite charge on conductor spikes → Safe discharge to earth via copper strip → Neutralization.
(B) Safe discharge to earth via copper strip → Static charge buildup on clouds → Neutralization → Induction of opposite charge.
(C) Induction of opposite charge → Neutralization → Static charge buildup on clouds → Safe discharge.
(D) Static charge buildup on clouds → Safe discharge → Neutralization → Induction of opposite charge.
(E) Answer not known

149. Identify the incorrect statement regarding the scattering of light:
(A) Scattering involves the absorption and immediate re-emission of light in various directions by particles.
(B) Blue light scatters much less than red light in the Earth's atmosphere.
(C) According to Rayleigh's law, the intensity of

NODIA

scattered light is inversely proportional to the fourth power of its wavelength.
(D) The sky appears dark to astronauts because there is no atmosphere to scatter sunlight.
(E) Answer not known

150. Match the following mirrors and lenses with their typical uses:
List I: (Optical Components)
P. Convex Mirror
Q. Concave Mirror
R. Convex Lens
S. Concave Lens
List II: (Typical Uses)
I. Reflecting telescope objective (Newtonian)
II. Magnifying glass
III. Rear-view mirror in vehicles
IV. Spyhole in doors
(A) P-III, Q-I, R-II, S-IV
(B) P-I, Q-III, R-II, S-IV
(C) P-III, Q-II, R-I, S-IV
(D) P-IV, Q-I, R-II, S-III
(E) Answer not known

151. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Danger signals and warning lights on tall buildings are typically red in colour.
Reason (R): Red light has the longest wavelength in the visible spectrum and undergoes the least scattering by fog, smoke, or rain.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

152. Conceptually, if the absolute refractive index of a glass block is 1.5, what is the speed of light within that glass block?
(A) 2×10^8 m/s
(B) 3×10^8 m/s
(C) 4.5×10^8 m/s
(D) 1.5×10^8 m/s
(E) Answer not known

153. Identify the incorrectly matched pair regarding units of magnetism:
(A) Magnetic flux - Weber (Wb)
(B) Magnetic permeability - Henry (H)
(C) Magnetic field strength (Magnetic induction) - Tesla (T)
(D) Pole strength - Ampere-meter (A·m)
(E) Answer not known

154. Consider the following properties of artificial magnets:
I. They can be made in various shapes like bar, horseshoe, and cylindrical.
II. Their magnetic strength can be controlled and made much stronger than natural magnets.
III. They always require an electric current to maintain their magnetism.
IV. Alloys like Alnico are primarily used to make temporary electromagnets.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) III and IV
(C) I, III and IV
(D) I and II
(E) Answer not known

155. Which prominent feature defines the proper functioning of the 'blind spot' in the human eye?
(A) Optic nerve exit point with absolute absence of light-sensitive cells.
(B) It is the spot on the retina where color-detecting cone cells are most highly concentrated.
(C) It controls the amount of light entering the eye during sudden bright flashes.
(D) It actively helps in focusing distant objects onto the fovea.
(E) Answer not known

156. Arrange the path of a monochromatic light ray undergoing refraction through a glass prism in sequential order:
I. The ray emerges into the air, bending away from the normal.
II. The ray is incident on the first refractive surface of the prism.
III. The ray travels through the glass medium.
IV. The ray bends towards the normal as it enters the prism.
(A) II, IV, III, I

Click Here to Buy book on Amazon

(B) II, III, IV, I
(C) IV, II, III, I
(D) I, II, III, IV
(E) Answer not known

157. In a parallel circuit containing three different resistors, what inference can be accurately drawn about the electric current?
(A) The current is identical across all three resistors regardless of their resistance.
(B) The highest resistance branch will draw the maximum current.
(C) The current ceases to flow if any one resistor's value is lowered.
(D) The total current supplied by the battery is the sum of the currents flowing through the individual branches.
(E) Answer not known

158. Consider the following statements regarding factors affecting the resistance of a conductor:
I. Resistance is directly proportional to the length of the conductor.
II. Resistance is directly proportional to the area of cross-section.
III. Resistance is completely independent of the nature of the material.
IV. Resistance of pure metals generally decreases with an increase in temperature.
V. A thick wire has less resistance than a thin wire of the same material and length.
Which of the above statement(s) is/are incorrect?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, IV and V
(D) II, III and IV
(E) Answer not known

159. What is the most relevant scientific reason for utilizing optical fibres rather than standard copper wires in medical endoscopy?
(A) Optical fibres can conduct large amounts of heat to burn internal tumors through thermal radiation.
(B) They use total internal reflection to transmit images out of the body through bends with minimal loss.
(C) Optical fibres generate intense X-rays for internal imaging to detect abnormalities in soft tissue.
(D) Optical fibres carry strong electrical impulses to stimulate organ function during surgery.
(E) Answer not known

160. Which of the following is an exception, being the only wave listed that is NOT an electromagnetic wave?
(A) Microwave
(B) Gamma ray
(C) Infrared ray
(D) Ultrasound wave
(E) Answer not known

www.nodia.in

Downloaded from www.pdf.tube

135. What is the fundamental feature of infrasonic waves that allows them to travel long distances through the Earth?
(A) They have extremely high frequencies, which avoid absorption.
(B) They travel entirely at the speed of light through dense rock.
(C) They are electromagnetic in nature, easily passing through all rock types.
(D) Low frequency and long wavelength lead to minimal energy attenuation.
(E) Answer not known

136. Arrange the sequence of events in the operation of a SONAR system:
I. Reflected waves are received by the detector.
II. Ultrasonic waves are transmitted through the water.
III. The time interval between transmission and reception is recorded.
IV. Waves strike an underwater object and reflect back.
(A) II, IV, I, III
(B) II, I, IV, III
(C) IV, II, I, III
(D) III, II, IV, I
(E) Answer not known

137. When a sound wave travels from air into water, which of its properties fundamentally remains constant?
(A) Velocity
(B) Frequency
(C) Wavelength
(D) Amplitude
(E) Answer not known

138. Consider the following statements about Alternating Current (AC) and Direct Current (DC):
I. AC reverses its direction periodically.
II. DC flows continuously in one direction.
III. Most modern electronic devices internally operate on DC.
IV. AC is preferred for long-distance transmission to minimize energy loss.
V. A dry cell battery is a common source of AC.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, II and V
(D) I, III and V
(E) Answer not known

139. Which of the following setups is most relevant for converting a galvanometer into a voltmeter capable of measuring high potentials?
(A) Connecting a very high resistance in series.
(B) Connecting a very low resistance in series.
(C) Connecting a very high resistance in parallel.
(D) Bridging the terminals with a thick copper wire.
(E) Answer not known

140. Which of the following is an exception and NOT a standard safety device component of a domestic electrical circuit?
(A) Earth wire
(B) Miniature Circuit Breaker (MCB)
(C) Step-up Transformer
(D) Electric Fuse
(E) Answer not known

NODIA

141. Match the following physical properties with their behaviour in Light and Sound:
List I: (Physical Properties)
P. Need for a medium
Q. Speed in vacuum
R. Wave nature
S. Speed comparison in air vs water
List II: (Behaviour)
I. Transverse (Light) vs Longitudinal (Sound)
II. Light requires none, Sound requires one
III. Light travels slower in water; Sound travels faster in water
IV. Light is 3×10^8 m/s, Sound is 0 m/s
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-I, S-III
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

142. Which of the following best defines Magnetic Declination at a place?
(A) The angle which the magnetic needle makes with the horizontal surface.
(B) The magnetic flux density near the geographic poles.
(C) The angle between the magnetic meridian and the geographic meridian at that place.
(D) The difference in temperature between the

9. (B) Long-distance AC transmission suffers higher power loss compared to low-voltage DC methods. Alternating current is preferred for long-distance power transmission because it can be easily stepped up to very high voltages using transformers. High-voltage transmission significantly reduces the current, which minimizes energy loss due to heating in the transmission wires. Consequently, AC transmission over long distances is much more efficient than low-voltage direct current methods, which suffer from substantial energy dissipation.

10. (A) P-IV, Q-I, R-II, S-III
Fundamental electrical laws are expressed through specific mathematical formulas. Ohm's law relates voltage, current, and resistance. Joule's law of heating calculates the thermal energy generated by current over time. Coulomb's law determines the electrostatic force between two stationary point charges. The power formula defines the rate of electrical work based on the product of potential difference and electric current.

11. (C) A is true but R is false.
In domestic electrical wiring, appliances are connected in parallel to ensure each device receives the same voltage and can be operated independently. This configuration also results in a lower total resistance for the entire circuit compared to the resistance of individual components. The reason provided is false because a parallel connection decreases the overall resistance rather than increasing it.

12. (C) 4R
Resistance is directly proportional to the length of a conductor and inversely proportional to its cross-sectional area. When a uniform wire is stretched to double its original length while maintaining a constant volume, its cross-sectional area is reduced by half. Because the length doubles and the area is halved, the resistance increases by a factor of four, resulting in 4R.

13. (D) Temperature in metals - Inversely proportional to resistance
The resistance of a metallic conductor is determined by its length, cross-sectional area, and the nature of the material. However, resistance in metals is directly proportional to temperature. As the temperature of a metal increases, the positive ions vibrate more vigorously, leading to more frequent collisions with moving electrons. This increased internal friction results in higher resistance, making the inverse relationship false.

14. (B) I, III and IV
In series circuits, the current remains constant throughout, and a single component failure breaks the entire circuit path. In parallel circuits, the potential difference is constant across all branches. Importantly, the equivalent resistance of a parallel circuit is always less than the smallest individual resistance. Parallel connections allow independent operation of appliances, which is why they are used in domestic wiring.

15. (B) It has infinite resistance to avoid drawing current from the circuit.
An ideal voltmeter is designed to measure the potential difference between two points without altering the current flowing through the circuit. To achieve this, it must have infinite internal resistance, ensuring it draws no current into its own branch. It is always connected in parallel with the component or branch of the circuit whose voltage is being accurately measured by the device.

16. (A) III, II, I, IV
The distribution of electrical power to a domestic residence follows a specific sequential path. It originates from the service mains or utility poles and first enters the electric meter to measure consumption. From the meter, the electricity passes through the distribution board or main switch. Finally, it is distributed into various individual appliance circuits throughout the building for safe usage.

17. (A) Increase by four times
According to Joule's law of heating, the heat produced in a resistor is directly proportional to the square of the current passing through it. If the current is doubled while the resistance and time remain constant, the heat produced will increase by the square of two. Consequently, the total thermal energy generated in the resistor will be exactly four times the original value.

Click Here to Buy book on Amazon

magnets. Alnico, an alloy of aluminum, nickel, and cobalt, is specifically designed to have extremely high retentivity and coercivity, making it the most suitable material for permanent magnets.

37. (B) 100 turns
The relationship between voltage and the number of turns in a transformer is determined by the turns ratio formula. The ratio of the primary voltage to the secondary voltage is equal to the ratio of the number of turns in the primary coil to the secondary coil. For a step-down transformer reducing 220V to 11V with 2000 primary turns, the secondary coil must have 100 turns.

38. (C) II and IV
Faraday's laws of electromagnetic induction state that an EMF is induced whenever the magnetic flux linked with a circuit changes. The magnitude of this induced EMF is directly proportional to the rate of change of magnetic flux. These laws apply to any varying magnetic field and require a closed circuit for current to flow. Therefore, statements claiming an inverse relationship or constant field application are incorrect.

39. (D) Placing it inside a soft iron enclosure (magnetic shielding)
Sensitive magnetic instruments can be protected from external magnetic interference through a process called magnetic shielding. By placing the instrument inside an enclosure made of a high-permeability material like soft iron, the external magnetic field lines are diverted through the walls of the enclosure. This ensures that the interior space remains free from the influence of external magnetic fields, protecting the instrument's accuracy.

40. (A) Traditional magnetic compass needle
Electromagnets are used in devices where a controllable magnetic field is required, such as electric bells, maglev trains, and industrial cranes. A traditional magnetic compass, however, utilizes a small permanent magnet that reacts to the Earth's natural magnetic field. It does not require an electric current to function or maintain its magnetism, making it an exception to the applications of electromagnets.

41. (A) P-IV, Q-III, R-II, S-I
Various optical phenomena explain everyday sights. Total internal reflection provides the brilliant sparkle of diamonds. Dispersion splits white light into a rainbow spectrum within water droplets. Scattering of shorter wavelengths by atmospheric particles causes the sky to appear blue. Refraction of light passing through atmospheric layers of varying densities and temperatures results in the perceived twinkling of distant stars in the night sky.

42. (A) Ratio of the speed of light in a vacuum to its speed within the specific medium.
The absolute refractive index of a medium is a dimensionless number that describes how light propagates through it. It is defined as the ratio of the speed of light in a vacuum to the speed of light in that specific medium. This value indicates the degree to which light bends when entering the material and is fundamental to understanding optical properties and refraction.

43. (A) Both A and R are true and R is the correct explanation of A.
Optical fibres are capable of transmitting light signals over long distances with minimal energy loss. This efficiency is achieved through the phenomenon of total internal reflection. When a light beam enters the fibre, it repeatedly strikes the boundary between the core and the cladding at an angle greater than the critical angle, causing it to reflect completely and remain trapped within the core.

NODIA

44. (C) 3×10^8 m/s
The speed of light in a vacuum is a fundamental physical constant denoted by the letter 'c'. Its approximate value is 300 million meters per second, or 3×10^8 m/s. This speed represents the maximum limit at which all conventional matter and information in the universe can travel, according to the laws of modern physics and the theory of relativity.

45. (D) Concave mirror - Used in solar furnaces to concentrate sunlight
Concave mirrors have the unique ability to converge parallel rays of light toward a single focal point. This property makes them ideal for solar furnaces, where they concentrate sunlight to generate extreme heat. Convex mirrors are used

magnetic flux that produced it. This principle is a direct consequence of the law of conservation of energy. It ensures that mechanical work must be done against this opposition to generate electrical energy through the process of induction.

28. (A) Radio waves, Microwaves, Visible light, X-rays
The electromagnetic spectrum is organized by the frequency and wavelength of different types of radiation. Radio waves have the lowest frequency and longest wavelength. Microwaves follow, then visible light, which occupies a narrow band. X-rays possess much higher frequencies and energy levels. This sequence represents the correct ascending order of frequency, which is directly proportional to the energy of the photons.

29. (D) It can be used to alter the voltage of direct current (DC) effectively.
A transformer is a device that operates on the principle of mutual induction to step up or step down alternating voltage. Because mutual induction requires a continuously changing magnetic flux, a transformer cannot function with a steady direct current. Transformers are highly efficient for AC applications, but using them with DC would result in zero induced voltage after the initial connection.

30. (A) P-III, Q-IV, R-II, S-I
Different regions of the electromagnetic spectrum have specific practical applications. Infrared rays are utilized in night vision technology. Ultraviolet rays are highly effective for sterilizing medical and surgical instruments. Gamma rays, due to their high energy, are used in cancer tumor treatments. Microwaves are fundamental to the operation of radar systems used in navigation and weather tracking across various industries.

31. (C) A is true but R is false.
The core of a transformer is constructed from thin, insulated laminations of soft iron rather than a single solid block. This design specifically aims to minimize the formation of eddy currents, which lead to energy loss through heating. By reducing these circulating currents, the overall efficiency of the transformer is improved. The reason provided is false as lamination decreases rather than increases currents.

32. (D) Electromagnetic induction
An electric generator is a device that converts mechanical energy into electrical energy. Its operation is based on the fundamental principle of electromagnetic induction, discovered by Michael Faraday. When a coil is rotated within a magnetic field, the magnetic flux passing through the coil changes over time. This changing flux induces an electromotive force, which generates an electric current in the circuit.

33. (D) Battery - Provides alternating current to maintain polarity
An electromagnet consists of a soft iron core wrapped with insulated copper wire. When a direct current from a battery flows through the coil, the core becomes temporary magnetized. Using an alternating current would cause the magnetic poles to switch rapidly at the supply frequency, making it unsuitable for applications requiring a stable, constant magnetic polarity and strength in one direction.

34. (D) II
An electric motor is a device designed to convert electrical energy into mechanical energy. It operates based on the magnetic effect of current, specifically the force experienced by a current-carrying conductor in a magnetic field. While it uses a commutator and Fleming's left-hand rule, it does not function on the principle of electromagnetic induction, which is the primary principle behind electric generators.

35. (A) An AC generator employs slip rings, whereas a DC generator uses a split-ring commutator.
The primary structural difference between AC and DC generators lies in the way current is collected from the rotating armature coil. An AC generator uses continuous slip rings to maintain a consistent connection, resulting in an alternating output. In contrast, a DC generator utilizes a split-ring commutator that reverses the connection every half-turn, ensuring that the output current flows in one direction.

36. (A) III, I, IV, II
Materials for magnets are selected based on their magnetic properties. Wood is non-magnetic and least suitable. Soft iron is easily magnetized but loses its magnetism quickly. Steel has better retentivity, making it suitable for permanent

Downloaded from www.pdf.tube

18. (A) I, II, III and V
Capacitors are electronic components that store electrical energy within an electric field between two plates. Their capacitance, measured in Farads, increases when a dielectric medium is introduced. They are widely used in radio circuits for tuning frequencies. Crucially, in direct current circuits, a fully charged capacitor blocks the flow of current, acting as an open circuit rather than a short circuit.

19. (A) High resistance and low melting point
A fuse wire is a critical safety device designed to protect electrical circuits from excessive current. It is constructed from a material that possesses high electrical resistance and a low melting point. When the current exceeds a safe limit, the high resistance causes rapid heating, which quickly melts the wire. This breaks the circuit and prevents damage to appliances or potential fires.

20. (D) Miniature Circuit Breaker (MCB)
Many electrical devices, such as irons, toasters, and traditional fuses, utilize the heating effect of electric current to function or provide protection. However, a Miniature Circuit Breaker operates primarily on electromagnetic principles. It uses a solenoid or bimetallic strip to mechanically trip the circuit during an overload or short circuit, relying on magnetic force rather than purely on thermal melting for protection.

21. (A) P-II, Q-IV, R-I, S-III
Magnetic declination is the angle between geographic and magnetic meridians at a location. Magnetic dip refers to the angle the Earth's total magnetic field makes with the horizontal plane. Magnetic flux represents the total number of field lines passing through a given area. Magnetic field intensity is defined as the force experienced by a unit north pole placed at a specific point.

22. (C) The temperature above which a ferromagnetic material becomes paramagnetic.
The Curie temperature is a critical thermal point specific to magnetic materials. Above this temperature, a ferromagnetic material loses its ability to possess a permanent magnetic field as its magnetic moments become randomly oriented due to thermal agitation. At this stage, the material transitions to a paramagnetic state, where it is only weakly attracted by an external magnetic field without permanent magnetization.

23. (B) Both A and R are true but R is not the correct explanation of A.
The Earth's magnetic poles are not located exactly at the geographic poles, a phenomenon that creates magnetic declination. While the convective currents of molten iron in the Earth's outer core generate the magnetic field and cause it to shift over time, this dynamic process explains the movement and existence of the field rather than the specific offset from the rotational axis.

24. (A) 0 degrees
The angle of dip, or magnetic inclination, is the angle that the Earth's total magnetic field vector makes with the horizontal plane. At the magnetic equator, the magnetic field lines are perfectly parallel to the Earth's surface. Consequently, the angle of dip is zero degrees. In contrast, at the magnetic poles, the field lines are vertical, resulting in a dip of ninety degrees.

25. (B) Maxwell's right-hand grip rule - Direction of magnetic field around a straight current-carrying conductor
Maxwell's right-hand grip rule provides a simple method to determine the direction of the magnetic field surrounding a straight current-carrying conductor. When the thumb points in the direction of the current, the curled fingers indicate the direction of the field lines. Other rules, such as Fleming's left and right-hand rules, are used for motors and generators, respectively, to find force and induction directions.

26. (C) I
Magnetic field lines are visual representations used to describe the direction and strength of a magnetic field. Outside a magnet, these field lines emerge from the North pole and enter the South pole. They form continuous, closed loops that never intersect each other. The density or closeness of these lines indicates the relative magnitude of the magnetic field in a given region.

27. (A) Induced current direction opposes the flux change producing it, conserving energy.
Lenz's Law states that the direction of an induced electric current is such that the magnetic field it creates always opposes the change in the

NODIA

for wide-angle views, such as rear-view mirrors, while plane mirrors are used in households for general reflection without changing the size of the image.

46. (A) I and II
The laws of reflection state that the angle of incidence is always equal to the angle of reflection and that the incident ray, reflected ray, and normal all lie in the same plane. These fundamental laws are universally valid for all surfaces, including both smooth and rough ones. In the case of rough surfaces, diffuse reflection occurs, but the laws still apply locally.

47. (B) Virtual, erect, and magnified
When an object is placed between the optical center and the principal focus of a convex lens, the refracted rays diverge. To an observer, these rays appear to originate from a point behind the object on the same side of the lens. This results in the formation of an image that is virtual, erect, and magnified, which is the principle used in magnifying glasses.

48. (A) Diamond > Crown Glass > Water > Air
The refractive index is a measure of the optical density of a medium. Diamond has an exceptionally high refractive index, which accounts for its brilliant sparkle. Crown glass has a lower value than diamond but is more optically dense than water. Air has a refractive index very close to one, representing the least optically dense medium among the common materials listed in the sequence.

49. (A) The speed of light increases when it enters a denser medium from a rarer medium.
During refraction, light changes its speed and direction when passing between media of different optical densities. When moving from a rarer to a denser medium, light always slows down and bends toward the normal. Importantly, the frequency of light remains constant throughout this transition, while the wavelength and speed change. Therefore, the statement claiming an increase in speed in denser media is incorrect.

50. (A) P-III, Q-I, R-IV, S-II
Vision defects are corrected using specific types of lenses. Myopia is corrected with concave lenses to diverge incoming light. Hypermetropia requires convex lenses to increase convergence. Presbyopia, an age-related condition affecting near vision, is often addressed with bifocal lenses. Astigmatism, caused by irregular corneal curvature, necessitates cylindrical lenses to focus light correctly onto the retina, ensuring clear and undistorted vision for the affected person.

51. (A) Both A and R are true and R is the correct explanation of A.
During sunrise and sunset, sunlight travels a much longer distance through the Earth's atmosphere. Shorter wavelengths, such as blue and violet, are scattered away by atmospheric particles. Red light, having the longest wavelength, undergoes the least scattering and reaches the observer's eyes. This phenomenon explains why the sun and the surrounding sky appear reddish during these times of the day.

52. (D) It increases
The focal length of a lens depends on the relative refractive index between the lens material and the surrounding medium. When a glass lens is moved from air to water, the difference between the refractive indices decreases. This reduction in bending power causes light rays to converge further away from the lens, thereby increasing its focal length compared to its focal length in air.

53. (B) Blind spot - The area on the retina with the maximum concentration of light-sensitive cells
The human eye contains several specialized structures for vision. The iris regulates light entry, and ciliary muscles adjust the lens's focal length. The retina acts as the screen where images are formed. However, the blind spot is the location where the optic nerve exits the eye; it lacks any photoreceptor cells, making it an exception rather than the area of maximum cell concentration.

54. (C) I and IV
Images formed by plane mirrors are always virtual, erect, and the same size as the object. They are laterally inverted and located at the same distance behind the mirror as the object is in front. Therefore, statements claiming that plane mirror images are real, inverted, or magnified are incorrect regarding the fundamental properties of these standard flat reflective surfaces.

Click Here to Buy book on Amazon

91. (A) Both A and R are true and R is the correct explanation of A.
Tungsten is the preferred material for incandescent lamp filaments because it possesses an exceptionally high melting point of approximately 3422 degrees Celsius. This allows the filament to reach the very high temperatures necessary to emit bright light without melting. Additionally, tungsten maintains its structural strength and has a very low rate of evaporation at these extreme operating temperatures, ensuring durability.

92. (C) The total power consumed will be less, and they will glow dimmer.
When bulbs are connected in series, the total resistance of the circuit increases, which significantly reduces the total current drawn from the supply. Since the power consumed by each bulb depends on the square of the current, the bulbs will glow much dimmer than if they were connected in parallel. Additionally, the supply voltage is divided between the two bulbs in a series connection.

93. (D) Live wire - White
In modern Indian domestic wiring, a standardized color code is used for safety and identification. The live wire is traditionally red or brown. The neutral wire is color-coded black or blue. The earth wire is consistently green or yellow-green. A white wire is not a standard color used for a live power line in this coding system. Following these codes is crucial for safe electrical installations.

94. (C) II and IV
Joule's law of heating defines the heat produced in a conductor as directly proportional to the square of the current, the resistance, and the time of flow. This law applies to both direct and alternating currents. Therefore, statements claiming that heat is inversely proportional to resistance or that the law only applies to direct current are scientifically inaccurate. These parameters are essential for designing safe heating elements.

95. (B) Connecting a low resistance (shunt) in parallel
A galvanometer can be converted into an ammeter by connecting a very low resistance, known as a shunt, in parallel with its coil. This shunt allows the majority of the current to bypass the sensitive galvanometer mechanism. This configuration enables the measurement of large currents while protecting the instrument and ensuring the ammeter has a low total resistance, which minimizes its impact on the circuit.

96. (A) II, III, I, IV
Electricity distribution follows a specific sequence from the source to the end user. It starts with a power plant generator. It is then passed through a step-up transformer to increase voltage for efficient long-distance transmission. Near the destination, a sub-station step-down transformer reduces the voltage. Finally, a distribution pole transformer lowers the voltage further to the standard levels required for safe domestic use.

97. (A) Resistance increases due to more frequent collisions between free electrons and vibrating metal ions.
In metallic conductors like copper, electrical resistance arises from collisions between moving free electrons and metal ions. As the temperature of the conductor increases, the ions vibrate more vigorously. This increased thermal agitation leads to more frequent collisions with the drifting electrons, which hinders their flow. Consequently, the electrical resistance of the metal increases as its temperature rises, a property fundamental to many materials.

98. (A) I, II, III and IV
Resistance is the property of a conductor that opposes charge flow, measured in ohms. While many materials follow Ohm's law, it fails under extreme conditions like very high temperatures. Modern electronic components like diodes are non-ohmic. Crucially, insulators have extremely high, rather than zero, resistance, which prevents current flow. Therefore, statements claiming insulators have zero resistance are incorrect regarding their electrical properties.

99. (A) To reverse the direction of current in the armature coil every half rotation.
The split-ring commutator is a vital component of a direct current motor. Its primary function is to reverse the direction of the electric current flowing through the armature coil every half-rotation. This reversal ensures that the magnetic torque acting on the coil always pushes it in the

NODIA

Both infrasound and ultrasound are generally inaudible to the human ear without specialized equipment.

65. (A) Ripples on water surface - Transverse mechanical waves
Mechanical waves are classified by the direction of particle motion. Ripples on the surface of water are transverse waves because the water particles move up and down, perpendicular to the wave's direction of travel. Sound waves in air are longitudinal waves consisting of compressions and rarefactions. Light and X-rays are electromagnetic waves, which do not require a material medium and are transverse in nature.

66. (B) I and III
The speed of sound in air is influenced by several environmental factors. It increases with rising temperature as molecules move more rapidly. Humidity also increases the speed because moist air is less dense than dry air. Interestingly, at a constant temperature, changes in atmospheric pressure do not affect the speed of sound. Thus, sound travels faster on warm, humid days compared to cold, dry ones.

67. (A) Persistent sound due to multiple reflections from interior surfaces.
Reverberation is the persistence of sound in an enclosed space after the original source has stopped. it is caused by multiple reflections from hard surfaces like walls, ceilings, and floors. In large halls or auditoriums, excessive reverberation can overlap successive sounds, making speech or music unintelligible. This necessitates the use of sound-absorbent materials to manage the decay of sound energy effectively.

68. (A) Air < Water < Iron < Aluminium
The speed of sound depends on the elasticity and density of the medium. Sound travels slowest in gases like air, faster in liquids like water, and fastest in solids. Among solids, materials with higher elasticity, such as iron and aluminum, provide the highest speeds. Aluminium typically conducts sound faster than iron due to its specific physical properties at room temperature.

NODIA

69. (B) Sterilization of drinking water by destroying bacteria directly through radiation.
Ultrasound has numerous applications in medicine and industry, such as imaging the heart, detecting cracks in metal blocks, and breaking down kidney stones. However, ultrasound is a mechanical wave, not electromagnetic radiation. While high-intensity ultrasound can mechanically disrupt some bacteria, it is not used for the direct sterilization of drinking water through radiation, which typically involves ultraviolet light or chemical treatments.

70. (A) P-II, Q-III, R-IV, S-I
Various sensing technologies utilize different types of waves. SONAR uses ultrasonic waves to detect underwater objects. RADAR relies on radio waves for tracking aircraft. LIDAR employs laser light pulses to map distances and terrain. A stethoscope functions based on the multiple reflection of sound waves within its tubes, allowing doctors to hear the internal sounds of a patient's body clearly.

71. (A) Both A and R are true and R is the correct explanation of A.
Bats are able to navigate and hunt in total darkness through a biological sonar system called echolocation. They emit high-frequency ultrasonic pulses that bounce off obstacles or prey. By detecting and analyzing the reflected echoes, bats can determine the size, distance, and direction of objects in their path. This allows them to avoid collisions and catch insects with remarkable precision during flight.

72. (A) 17.2 m
To hear a distinct echo, the reflected sound must reach the ear at least 0.1 seconds after the original sound. At a standard speed of 344 m/s, the sound must travel a total distance of 34.4 meters. Since the sound travels to the reflecting surface and back, the minimum distance between the source and the surface must be exactly half that distance, or 17.2 meters.

73. (B) Busy city traffic - 30 dB
Noise levels are measured on a logarithmic decibel scale. Normal breathing is very quiet, around 10 dB. Normal conversation typically occurs at 60 dB, and a jet engine produces about 140 dB. Busy city traffic is significantly louder

standard VIBGYOR sequence, representing the correct ascending order of wavelengths for these specific colors.

109. (D) The magnifying power is highest when the image is formed at infinity.
A simple microscope uses a single convex lens to produce a virtual, erect, and magnified image. To achieve magnification, the object must be placed within the lens's focal length. However, the magnifying power is actually maximized when the final image is formed at the least distance of distinct vision, typically 25 centimeters for humans, rather than when the image is formed at infinity.

110. (A) P-II, Q-IV, R-I, S-III
Different telescope designs utilize various optical configurations. The Galilean telescope uses a convex objective and a concave eyepiece. An astronomical refracting telescope employs two convex lenses. Reflecting telescopes, such as the Newtonian and Cassegrain designs, use a large concave primary mirror. Cassegrain models are distinguished by using a convex secondary mirror to reflect light through a hole in the primary mirror.

111. (C) A is true but R is false.
Dentists use concave mirrors because they can produce a magnified and erect image of an object when it is placed very close to the mirror. This allows for a detailed and clear view of the teeth. The reason provided is false because the image formed in this specific position is virtual and erect, not real and inverted as stated in the claim.

112. (D) The emergent ray is perfectly parallel to the incident ray but laterally displaced.
When a light ray enters a rectangular glass slab obliquely, it undergoes refraction twice—once upon entering and once upon exiting. Because the two faces of the slab are parallel, the bending at the first surface is exactly reversed at the second surface. This results in the emergent ray being parallel to the original incident ray, although it is laterally shifted or displaced.

113. (A) Raman scattering - Complete absorption of light without any change in wavelength
Raman scattering is characterized by the inelastic scattering of photons, which results in a shift in the wavelength or energy of the light. Rayleigh scattering involves particles smaller than the wavelength, like air molecules. Mie scattering occurs with larger particles like dust or water droplets. The Tyndall effect is the visible scattering of light by particles in a colloidal suspension or fine mixture.

114. (C) II and IV
Electromagnetic waves are transverse waves characterized by oscillating electric and magnetic fields. Crucially, these fields oscillate perpendicular to each other and perpendicular to the direction of wave propagation. They do not require a material medium to travel. Therefore, statements describing them as longitudinal or having parallel oscillating fields are fundamentally incorrect regarding their physical nature and wave structure.

115. (A) Blurred vision in one specific plane due to irregular curvature of the cornea.
Astigmatism is a common vision defect caused by an irregular or asymmetrical curvature of the cornea or the crystalline lens. This abnormality prevents light from focusing evenly onto the retina, causing blurred or distorted vision at all distances. Usually, vision is more severely affected in one specific plane or orientation than in others, requiring correction with specialized cylindrical lenses.

116. (A) III, I, II, IV
In a basic camera, light first reflects off the subject and travels toward the lens. It then passes through the aperture, which controls the light intensity. When the shutter opens, the light reaches the film or sensor. The lens focuses the light to form a real and inverted image of the object, which is then captured and recorded by the device's sensor.

117. (B) f = –10 cm, Concave mirror
The focal length of a spherical mirror is exactly half of its radius of curvature. According to the standard sign convention, a negative radius of curvature indicates a concave mirror. Therefore, if the radius is –20 cm, the focal length is –10 cm. This negative value identifies the mirror as a converging or concave mirror, used to focus light to a point.

Downloaded from www.pdf.tube

consumed when an electrical appliance with a power rating of one kilowatt, or 1000 watts, is operated continuously for a duration of one hour. In terms of the SI unit of energy, one kilowatt-hour is exactly equivalent to 3.6 million Joules, often referred to as one unit.

83. (A) Both A and R are true and R is the correct explanation of A.
High-power electrical appliances with metallic bodies require earthing for safety. The earth wire connects the appliance's metal casing to a copper plate buried deep in the ground. In case of an insulation failure where current leaks to the metallic body, the earth wire provides a low-resistance path, allowing the current to flow safely into the Earth and preventing dangerous electric shocks.

84. (D) 220 V, 50 Hz
Electricity supply standards vary globally for domestic use. In India, the standard alternating current supplied to residential buildings has a potential difference of 220 volts and a frequency of 50 Hertz. This means the current reverses its direction 100 times every second. These parameters are essential for the safe and efficient operation of standardized electrical appliances and lighting systems within the country.

85. (B) Manganin - Alloy used for standard resistors
Manganin is an alloy of copper, manganese, and nickel known for having a very low temperature coefficient of resistance. This property makes it ideal for manufacturing standard resistors and precision instruments. Silicon is a semiconductor, nichrome is a resistive alloy used in heating elements, and ebonite is an insulator. Therefore, Manganin is correctly matched with its use in making standard resistors.

86. (A) I and II
Capacitors in a circuit follow specific rules for equivalent capacitance. In a parallel combination, the total capacitance is the sum of individual values, increasing the overall storage capacity. In a series combination, the equivalent capacitance decreases according to the reciprocal rule. Importantly, in a series circuit, the charge across each capacitor is identical, while the potential difference across each component may vary.

87. (D) An MCB operates based on electromagnetism and trips during a fault, whereas a fuse melts due to heating.
Both fuses and Miniature Circuit Breakers protect circuits from overcurrent, but they use different mechanisms. A fuse contains a wire that melts when heated by excessive current, requiring replacement after use. An MCB uses an electromagnetic or bimetallic mechanism to trip a switch during a fault. Unlike a fuse, an MCB can be easily reset and reused, offering a more convenient and modern protection method.

88. (A) All in parallel, Two in parallel with one in series, All in series
The equivalent resistance of a group of resistors depends on how they are connected. The lowest possible resistance is achieved when all resistors are connected in parallel. A mixed combination of series and parallel yields an intermediate value. The highest possible equivalent resistance is obtained when all resistors are connected in a single series path, as the total resistance is simply their sum.

89. (B) They oxidize rapidly at high temperatures.
Heating elements are typically made from alloys like nichrome because they possess high electrical resistivity and high melting points. Crucially, these alloys are resistant to oxidation even when operating at very high temperatures. Pure metals would oxidize and break down much faster, making them unsuitable for long-term use in appliances. Therefore, the statement claiming they oxidize rapidly at high temperatures is incorrect.

NODIA

90. (A) P-III, Q-II, R-IV, S-I
Several scientists made fundamental contributions to electromagnetism. Oersted discovered that electric current creates a magnetic field. Faraday discovered electromagnetic induction, the basis for modern generators. Hertz experimentally proved the existence of electromagnetic waves. Ampere formulated the laws of electrodynamics, which describe the mathematical relationship between electric currents and the magnetic fields they produce throughout various types of conductors and circuit configurations.

127. (B) Particle oscillation is parallel to propagation in longitudinal waves, and perpendicular in transverse.
The fundamental distinction between wave types lies in the direction of particle displacement relative to the wave's travel. In longitudinal waves, such as sound, particles oscillate parallel to the direction of propagation. In transverse waves, such as light or ripples on water, particles or fields oscillate perpendicular to the direction in which the wave energy travels through the specific medium.

128. (A) Elephant < Human < Dog < Bat
Different animals are sensitive to different frequency ranges. Elephants can detect very low-frequency infrasound. Humans have a standard hearing range up to 20,000 Hertz. Dogs can hear much higher frequencies than humans, often up to 45,000 Hertz. Bats use extremely high-frequency ultrasound for echolocation, possessing the highest hearing thresholds among the organisms in this sequence, often exceeding 100,000 Hertz.

129. (A) It is heavily utilized in radio broadcasting to carry audio signals.
Ultrasound is used in diverse fields, including medical imaging, cleaning intricate parts, and non-destructive testing of metals. However, it is not used in radio broadcasting. Radio signals are electromagnetic waves with much lower frequencies than ultrasound, which is a mechanical wave. Radio broadcasting relies on the transmission of these electromagnetic waves through space rather than using high-frequency mechanical sound waves.

130. (A) P-III, Q-II, R-IV, S-I
The intensity of sound determines its physical and psychological impact. A level of 30 decibels is characteristic of a quiet whisper. Normal conversation typically occurs around 60 decibels. Persistent exposure to 90 decibels can lead to permanent hearing damage. At 140 decibels, sound reaches the threshold of pain, potentially causing immediate physical injury to the ear and auditory system.

131. (A) Both A and R are true and R is the correct explanation of A.
Concert halls and cinemas are designed with acoustics in mind to provide the best auditory experience. Materials like heavy curtains and thick carpets are intentionally used because they are porous and absorb sound waves. This absorption prevents sound from reflecting multiple times, effectively reducing excessive reverberation and preventing echoes from blurring the clarity and quality of the audio performance.

132. (D) 3000 m
SONAR calculates depth by measuring the time taken for a sound pulse to travel to the seabed and back. If the total time is 4 seconds, the sound takes exactly 2 seconds to reach the bottom. Given a speed of 1500 m/s in seawater, the depth is the product of speed and one-way time, resulting in a total of 3000 meters.

133. (B) Phase - Speed of sound
Human perception of sound is linked to physical properties of the wave. Frequency determines pitch, and amplitude determines loudness. The complexity of the waveform dictates the quality or timbre. However, the phase of a sound wave does not determine the speed of sound; the speed is instead determined by the elasticity and density of the medium through which it travels.

134. (C) III and IV
Effective noise control involves reducing sound at the source and blocking its path. Planting trees and using sound-absorbent materials are proven methods. In contrast, removing silencers or increasing the acoustic reflection of industrial walls would significantly increase noise pollution levels. Therefore, statements advocating for these actions are incorrect regarding standard noise reduction and environmental management strategies for protecting public health.

135. (D) Low frequency and long wavelength lead to minimal energy attenuation.
Infrasonic waves possess extremely low frequencies and very long wavelengths. This physical characteristic allows them to bypass many small-scale obstacles and travel through the Earth's crust with very little energy attenuation. Because they are not easily absorbed or scattered by geological structures, they can propagate over

Click Here to Buy book on Amazon

same direction, allowing for continuous and smooth rotational motion of the motor's shaft during operation.

100. (D) Light Emitting Diode (LED)
Ohmic conductors, such as copper, aluminum, and silver, maintain a constant resistance where current remains directly proportional to the applied voltage. In contrast, a Light Emitting Diode is a semiconductor device. It is non-ohmic because the relationship between current and voltage is non-linear. The current increases exponentially once the applied voltage exceeds a specific threshold, which is characteristic of semiconductor diodes.

101. (A) P-II, Q-I, R-IV, S-III
The electromagnetic spectrum is categorized by specific wavelength and frequency ranges. Radio waves have long wavelengths exceeding one millimeter. Visible light spans a narrow band from approximately 400 to 700 nanometers. X-rays possess extremely short wavelengths between 0.01 and 10 nanometers. Infrared radiation occupies the region between visible light and microwaves, starting from 700 nanometers and extending up to one millimeter.

102. (C) The angle made by the Earth's total magnetic field vector with the horizontal plane.
The angle of dip, or magnetic inclination, is the angle that the Earth's total magnetic field vector makes with the horizontal plane at a specific location. This angle varies across the planet's surface, being zero at the magnetic equator and ninety degrees at the magnetic poles. It is measured using a specialized instrument called a dip circle or inclinometer.

103. (A) Both A and R are true and R is the correct explanation of A.
A standard magnetic compass needle relies on the horizontal component of the Earth's magnetic field to align itself and indicate direction. At the Earth's magnetic poles, the magnetic field lines are perfectly vertical. Consequently, the horizontal component of the field is zero, and the compass needle cannot point in any specific horizontal direction, making it useless for traditional navigation at these locations.

104. (A) The velocity of light
In a vacuum, all forms of electromagnetic radiation, regardless of their frequency or energy, travel at exactly the same speed. This universal constant is known as the velocity of light, approximately 3×10^8 meters per second. This includes radio waves, microwaves, visible light, X-rays, and gamma rays, which all propagate at this maximum limit through empty space.

NODIA

105. (B) Total Internal Reflection - Looming in cold regions
Looming is an optical phenomenon occurring in cold regions where distant objects appear elevated or even inverted in the sky due to total internal reflection in atmospheric layers. Other matches are incorrect because scattering causes the blue sky, dispersion forms rainbows, and refraction leads to the apparent shallow depth of swimming pools. Total internal reflection is essential for this specific atmospheric effect.

106. (A) I and II
Total internal reflection occurs when light traveling through an optically denser medium strikes the interface of an optically rarer medium. For this phenomenon to happen, the angle of incidence within the denser medium must exceed the critical angle specific to that pair of media. If these conditions are met, all the light is reflected back into the denser medium rather than refracting.

107. (A) Ability of the eye lens to adjust focal length for clear near and far vision.
The power of accommodation is the ability of the human eye to modify the focal length of its crystalline lens. This adjustment is performed by the ciliary muscles, which change the curvature of the lens. This vital process allows the eye to form clear and sharp images of objects located at various distances, from the near point to infinity, onto the retina.

108. (B) Violet, Blue, Yellow, Red
The colors of the visible spectrum correspond to different wavelengths of light. Violet has the shortest wavelength and highest frequency. As we move through blue, green, and yellow, the wavelength increases. Red light possesses the longest wavelength and the lowest frequency within the visible spectrum. This follows the

55. (D) Distant object images are formed in front of the retina.
Myopia, or near-sightedness, is a vision defect where a person can see nearby objects clearly but distant objects appear blurred. This occurs because the eye's refractive power is too strong or the eyeball is too long, causing light from distant objects to converge in front of the retina rather than on it. This defect is typically corrected using diverging or concave lenses.

56. (A) II, I, III, IV
Light entering the eye follows a specific sequential path. It first passes through the cornea, the transparent front layer. Next, it moves through the aqueous humor, a watery fluid. It then enters the pupil, whose size is controlled by the iris. Finally, the light reaches the crystalline lens, which focuses the image onto the retina at the back of the eyeball.

57. (B) +1.5D
When two thin lenses are placed in contact, the total power of the combination is the algebraic sum of their individual powers. For a lens with a power of +3D and another with −1.5D, the resulting power is +3.0 + (−1.5), which equals +1.5D. This positive value indicates that the combination behaves as a converging lens with a moderate focusing power.

58. (A) I, II, IV and V
Dispersion occurs when white light passes through a prism and splits into its component colors because different wavelengths travel at different speeds in glass. Violet light has the shortest wavelength and bends the most, while red light bends the least. Isaac Newton demonstrated that these colors could be recombined using an inverted prism to produce white light again, proving sunlight is composed of multiple colors.

59. (A) Total Internal Reflection
A mirage is an optical illusion commonly observed in hot deserts or on asphalt roads. It is caused by atmospheric refraction and total internal reflection of light. In hot weather, the air near the ground becomes warmer and less dense than the air above. Light from the sky travels through these layers, gradually bending until it undergoes total internal reflection, creating the illusion of water.

60. (C) The Tyndall effect observed in a dusty room
Atmospheric refraction is responsible for various phenomena, including the twinkling of stars, the apparent flattening of the sun at the horizon, and advanced sunrise or delayed sunset. However, the Tyndall effect is the scattering of light by colloidal particles or small suspended particles. It is an example of scattering rather than the bending of light caused by changes in atmospheric density and temperature.

61. (A) P-II, Q-IV, R-I, S-III
Sound properties are measured using specific standardized units. Frequency, the number of vibrations per second, is measured in Hertz. Wavelength, the physical distance between successive peaks of a wave, is measured in meters. Loudness, a subjective perception of sound intensity, is measured in decibels. The speed of sound represents the distance traveled per unit time and is expressed in meters per second.

62. (C) Characteristic determining sound shrillness based on vibration frequency.
Pitch is the auditory sensation that allows the human ear to distinguish between sounds based on their frequency. A higher frequency of vibration produces a sound with a higher pitch, which is perceived as shriller. Conversely, a lower frequency results in a lower-pitched or deeper sound. Pitch is an important characteristic of musical sounds and is distinct from loudness or quality.

63. (C) A is true but R is false.
Sound travels significantly faster in solids than in gases because particles in solids are more tightly packed and the material is much more elastic. While solids are generally denser than gases, their higher modulus of elasticity dominates the speed calculation. The reason provided is false because solids have much higher densities than gases, which would normally slow down wave transmission if not for elasticity.

64. (D) 20 Hz to 20,000 Hz
The human ear is sensitive to a specific range of sound frequencies known as the audible range. For a healthy young adult, this range typically spans from 20 Hertz to 20,000 Hertz. Frequencies below 20 Hz are classified as infrasound, while those above 20,000 Hz are known as ultrasound.

Downloaded from www.pdf.tube

118. (A) I, II, III and IV
Refraction is governed by laws describing the relationship between incident and refracted rays. Snell's law defines the constant ratio of the sines of the angles. This constant represents the refractive index, which is related to the change in the speed of light. During refraction, the light's wavelength changes, but its frequency remains constant across the interface between the two media.

119. (D) It forms a virtual, erect, and diminished image, providing a wider field of view.
Convex mirrors are preferred for vehicle rear-view mirrors because they always produce a virtual, erect, and diminished image of objects. Because the image is smaller than the object, it allows the mirror to capture a much wider field of view compared to a plane mirror. This helps drivers see a larger area of the traffic and surroundings behind them more effectively.

120. (A) Remote control of television sets
Ultraviolet radiation is widely used for high-energy applications such as sterilizing surgical equipment, purifying water by damaging bacterial DNA, and identifying forged documents. However, television remote controls typically utilize infrared radiation, which is much lower in energy and safer for continuous human exposure. UV radiation is not suitable or common for standard consumer remote control technology in household devices.

121. (A) P-II, Q-I, R-IV, S-III
An echo is a single, distinct reflection of sound. Reverberation is the lingering of sound due to multiple reflections in a space. Resonance occurs when a system is forced to vibrate at its natural frequency, leading to large amplitudes. The Doppler effect describes the shift in frequency observed when there is relative motion between a source and an observer in various media.

122. (B) The characteristic that distinguishes two sounds of the same pitch and loudness produced by different sources.
Quality, or timbre, is the characteristic of sound that allows the human ear to distinguish between two sounds that have the same pitch and loudness. This property depends on the complexity of the sound wave and the presence of overtones. It is what allows us to differentiate between different musical instruments, such as a piano and a violin, playing the same note.

123. (A) Both A and R are true and R is the correct explanation of A.
The speed of sound in air is inversely proportional to the square root of the air's density. Moist air contains water vapor, which has a lower molecular mass than oxygen and nitrogen. This makes moist air less dense than dry air at the same temperature and pressure. Consequently, sound waves travel faster through more humid atmospheric conditions than through dry air.

NODIA

124. (C) 55 dB
Noise pollution has significant health implications, leading the World Health Organization to establish recommended limits. For residential areas during the daytime, the WHO suggests a maximum safe noise level of 55 decibels. At night, this recommended limit is lower, typically around 45 decibels, to ensure adequate sleep and reduce long-term physiological stress on residents living in urban or busy areas.

125. (D) Stethoscope - Multiple reflection of sound
A stethoscope is designed to transmit sounds from inside the body to the doctor's ears. It works through the principle of multiple reflection of sound waves within the tubes of the instrument. Other devices, such as megaphones, also use reflection to direct sound. These principles allow for the amplification and clear transmission of faint acoustic signals for diagnostic and communication purposes.

126. (B) I and III
Mechanical waves, including both longitudinal and transverse types, require a material medium to propagate. Longitudinal waves, such as sound, can travel through solids, liquids, and gases. However, transverse mechanical waves require a medium with shear strength, which means they can propagate through solids but generally cannot travel through the bulk of gases or low-viscosity liquids under normal environmental conditions.

than 30 dB, usually ranging between 70 and 85 dB. A level of 30 dB is more characteristic of a quiet whisper or a very soft background noise.

74. (D) III and IV
Sound waves are longitudinal mechanical waves that require a material medium and propagate through compressions and rarefactions. The speed of sound is affected by the density and elasticity of the medium. Loudness is directly proportional to the square of the amplitude, not inversely. Furthermore, speed is dependent on medium density. Thus, statements claiming independence from density or an inverse amplitude relationship are scientifically incorrect.

75. (A) It is produced by earthquakes, elephants, and whales.
Infrasound consists of sound waves with frequencies below 20 Hertz, which is lower than the range of human hearing. These waves are naturally produced by large-scale geological events like earthquakes and are used by large animals such as whales and elephants for long-distance communication. Because of their long wavelengths, infrasonic waves can travel through the Earth with very little energy attenuation.

76. (A) II, I, IV, III
Sound transmission through the human auditory system follows a specific sequence. Sound waves are first collected by the pinna and directed to the tympanic membrane or eardrum. The vibrations are then amplified by the auditory ossicles—the hammer, anvil, and stirrup—in the middle ear. Finally, these mechanical vibrations reach the cochlea in the inner ear, where they are converted into electrical nerve impulses.

77. (D) It becomes half
The speed of a wave in a medium is equal to the product of its frequency and wavelength. Since the speed of sound remains constant in a specific medium at a constant temperature, doubling the frequency must result in the wavelength being reduced by half. This inverse relationship ensures that the product of frequency and wavelength remains consistent with the constant speed of sound.

78. (A) I, III, IV and V
SONAR, or Sound Navigation and Ranging, is a technology used to determine the distance and direction of underwater objects. It transmits ultrasonic waves, which travel through water and reflect off surfaces. By measuring the time interval between transmission and detection, and using the formula relating distance to velocity and time, it can accurately map the seabed, detect submerged hills, or find sunken ships.

79. (B) Covering the walls and ceilings with sound-absorbent materials like compressed fibreboard
To minimize excessive reverberation and ensure audio clarity in a cinema hall or auditorium, it is necessary to reduce the reflection of sound. This is achieved by covering hard surfaces with sound-absorbent materials such as thick curtains, carpets, or compressed fibreboard. These materials absorb acoustic energy rather than reflecting it, preventing sounds from overlapping and becoming distorted due to multiple reflections.

80. (D) Sudden, high-intensity fluctuations in amplitude
Musical sounds are characterized by regular, periodic vibrations that produce a pleasing effect. They have well-defined pitches and continuous waveforms without abrupt changes. In contrast, noise is characterized by irregular vibrations and sudden, jarring fluctuations in amplitude and frequency. High-intensity fluctuations are typical of noise rather than the structured and rhythmic nature of musical sound, which maintains consistent characteristics over time.

81. (A) P-III, Q-IV, R-II, S-I
Standardized symbols are used to represent electrical components in circuit diagrams. A variable resistor is indicated by a zigzag line with an arrow. A closed plug key is shown as brackets containing a dot. An electric bulb is typically represented by a circle with a cross or filament symbol. Wires that cross without a joint are depicted with a semi-circular hump over another line.

82. (C) The electrical energy consumed by an appliance of 1000 watts operating for one hour.
The kilowatt-hour is a commercial unit of electrical energy. It represents the total energy

Click Here to Buy book on Amazon

thousands of kilometers, making them highly useful for detecting distant seismic events.

136. (A) II, IV, I, III
In a SONAR system, the process begins with a transmitter sending ultrasonic waves into the water. These waves travel until they strike an underwater object and reflect. The reflected waves are then picked up by a sensitive detector. Finally, the system records the total time elapsed between transmission and reception to calculate the distance and position of the submerged object accurately.

137. (B) Frequency
When any wave, including sound or light, moves from one medium into another, its speed and wavelength change to accommodate the new physical conditions. However, the frequency of the wave is determined solely by the source of vibration. Consequently, the frequency remains constant as the sound wave travels across the interface between air and water or any other media transition.

138. (A) I, II, III and IV
Alternating current reverses direction periodically and is ideal for efficient long-distance transmission. Direct current flows steadily in one direction and is the standard internal power source for electronic devices. A dry cell battery provides a steady direct current, not alternating current. Therefore, the statement identifying batteries as a source of AC is incorrect regarding the fundamental nature of chemical cells.

139. (A) Connecting a very high resistance in series.
To convert a sensitive galvanometer into a voltmeter capable of measuring high potentials, a very high resistance must be connected in series with the instrument. This ensures that only a tiny current flows through the galvanometer, protecting its sensitive coil while allowing most of the potential difference to drop across the high-value series resistor for accurate and safe measurement.

140. (C) Step-up Transformer
Domestic electrical circuits include several safety components designed to protect users and property. Earth wires prevent electric shocks from leakages, while fuses and Miniature Circuit Breakers (MCBs) protect against overcurrent and short circuits. A step-up transformer, however, is a power regulation device used in transmission rather than a safety device within a home's internal electrical system for protection against faults.

141. (A) P-II, Q-IV, R-I, S-III
Light and sound exhibit distinct physical behaviors. Sound requires a material medium to propagate and cannot travel in a vacuum, whereas light can. Light waves are transverse, while sound waves in air are longitudinal. Furthermore, light travels slower in water than in air, while sound travels significantly faster in water due to the medium's higher elasticity compared to compressible gases.

142. (C) The angle between the magnetic meridian and the geographic meridian at that place.
Magnetic declination is a geographical and magnetic measurement at a specific location on the Earth's surface. It is defined as the angle between the magnetic meridian, indicated by a compass needle, and the true geographic meridian. This angle varies depending on the observer's position on Earth and slowly changes over time due to the dynamic movement of the Earth's magnetic poles.

143. (A) Both A and R are true and R is the correct explanation of A.
A transformer is a static device that transfers electrical energy between circuits through mutual induction. While it can change the voltage and current levels based on the turns ratio of the coils, it cannot alter the frequency of the alternating current. The rate at which the magnetic flux alternates is identical in both the primary and secondary coils of the transformer.

144. (D) 25 cm
The least distance of distinct vision is the minimum distance from the eye at which an object can be seen clearly without any strain. For a healthy young adult with normal vision, this distance is approximately 25 centimeters. Below this distance, the eye's power of accommodation cannot sufficiently increase the lens's curvature to focus the image sharply onto the retina.

Downloaded from www.pdf.tube

145. (A) Optic nerve - Transmits electrical signals from the retina to the brain
The human eye works as an advanced optical system. The optic nerve plays the critical role of transmitting electrical impulses from the retina to the brain for interpretation into visual images. Other structures include the sclera as the protective layer, the cornea as the transparent front window, and the retina as the light-sensitive screen at the back of the eye.

146. (C) III
An AC generator works by rotating an armature coil within a magnetic field to induce a changing electromotive force. It uses slip rings to maintain a continuous connection with the external circuit while the coil rotates. Unlike the split-ring commutator used in a DC generator, slip rings allow the current to alternate its direction, which is characteristic of the alternating current output.

147. (A) It is the fundamental principle used in induction stoves and transformers.
Electromagnetic induction is a fundamental physical principle used in many modern technologies. It is the basis for the operation of electric generators, induction stoves, and transformers. These devices rely on changing magnetic fields to induce electric currents or voltages in conductors, enabling the generation and efficient transmission of electrical power across vast distances and for various residential and industrial applications.

148. (A) Static charge buildup on clouds → Induction of opposite charge on conductor spikes → Safe discharge to earth via copper strip → Neutralization.
A lightning conductor protects buildings by providing a safe path for static discharge. When clouds build up a static charge, they induce an opposite charge on the sharp spikes of the conductor. If lightning strikes, the electricity is channeled through a thick copper strip directly into the ground, neutralizing the charge and preventing severe structural damage to the building or its contents.

149. (B) Blue light scatters much less than red light in the Earth's atmosphere.
Scattering involves the absorption and redirection of light by atmospheric particles. According to Rayleigh's law, the intensity of scattering is inversely proportional to the fourth power of the wavelength. Since blue light has a shorter wavelength than red light, it scatters much more effectively. This explains why the clear daytime sky appears blue rather than red to observers on Earth.

NODIA

150. (A) P-III, Q-I, R-II, S-IV
Optical components have specific applications based on their refractive or reflective properties. Convex mirrors provide wide fields of view for vehicles. Concave mirrors are used as objectives in reflecting telescopes. Convex lenses act as magnifying glasses when objects are close. Concave lenses are used in spyholes to provide a wide-angle view of the external area through a door or small opening.

151. (A) Both A and R are true and R is the correct explanation of A.
Red light is universally used for danger signals and warning lights because it possesses the longest wavelength in the visible spectrum. This characteristic ensures that red light undergoes minimal scattering by small particles in the air, such as fog, smoke, or rain. Consequently, red signals remain highly visible from much greater distances than other colors, ensuring safety during adverse weather conditions.

152. (A) 2×10^8 m/s
The absolute refractive index of a medium is defined as the ratio of the speed of light in a vacuum to the speed of light in that medium. If the refractive index of glass is 1.5, the speed of light within it is calculated by dividing the vacuum speed by 1.5. This calculation results in a speed of exactly 2×10^8 meters per second.

153. (B) Magnetic permeability - Henry (H)
Magnetic properties are measured using various SI units. Magnetic flux is measured in Webers, and magnetic induction or field strength uses the Tesla. Pole strength is expressed in Ampere-meters. However, magnetic permeability is measured in Henries per meter, while the Henry itself is the unit of electrical inductance rather than permeability. This distinction is important for accurate physical measurements in electromagnetism.

154. (B) III and IV
Artificial magnets, like those made from Alnico or steel, can retain their magnetic properties permanently without an external current. Electromagnets, which are temporary, typically use a soft iron core to easily lose magnetism when the current stops. Therefore, statements claiming all artificial magnets require current or that Alnico is primarily for temporary magnets are incorrect regarding their permanent magnetic nature.

155. (A) Optic nerve exit point with absolute absence of light-sensitive cells.
The blind spot is a specific area on the retina of the human eye where the optic nerve exits to carry signals to the brain. Because this region lacks any light-sensitive photoreceptor cells, such as rods or cones, it is incapable of detecting light or forming images. This results in a small, natural gap in our field of vision that the brain typically compensates for.

156. (A) II, IV, III, I
When light enters a prism, it is first incident on the first refractive surface. It bends toward the normal as it moves from air into the denser glass. The light then travels through the glass medium until it reaches the second surface. Finally, it emerges back into the air, bending away from the normal toward the base of the prism.

157. (D) The total current supplied by the battery is the sum of the currents flowing through the individual branches.
In a parallel circuit, the total current supplied by the source is distributed among the various branches. According to Kirchhoff's current law, the total current is exactly equal to the sum of the individual currents flowing through each parallel resistor. The current in each branch depends inversely on the resistance of that particular branch path within the circuit.

158. (D) II, III and IV
The resistance of a conductor is affected by its dimensions, material, and temperature. It is inversely proportional to the area of cross-section and highly dependent on the nature of the material. In pure metals, resistance increases with temperature. Therefore, statements suggesting direct proportionality to area, material independence, or resistance decreasing with temperature are scientifically incorrect regarding metallic conductors.

159. (B) They use total internal reflection to transmit images out of the body through bends with minimal loss.
Optical fibres are essential for medical endoscopy because they can transmit high-quality images from inside the body. They use the principle of total internal reflection to carry light signals through flexible tubes that can navigate the body's natural curves. This allows doctors to visualize internal organs clearly with minimal invasiveness compared to traditional surgical procedures for internal examinations.

160. (D) Ultrasound wave
Microwaves, gamma rays, and infrared rays are all parts of the electromagnetic spectrum, consisting of oscillating electric and magnetic fields that travel at the speed of light. In contrast, ultrasound is a high-frequency mechanical wave. It consists of physical vibrations of particles in a medium and cannot travel through a vacuum, setting it apart from all forms of electromagnetic radiation.

www.nodia.in

Click Here to Buy book on Amazon

(E) Answer not known

14. Identify the correctly matched pair regarding thermal expansion.
(A) Linear expansion - Increase in length per unit length per degree temperature rise
(B) Cubical expansion - Increase in volume per unit volume per degree temperature rise
(C) Superficial expansion - Increase in area per unit area per degree temperature rise
(D) Isothermal expansion - Expansion with a simultaneous increase in temperature
(E) Answer not known

15. Consider the following statements about heat engines:
I. A heat engine continuously converts heat energy into mechanical work.
II. The source is maintained at a higher temperature than the sink.
III. The efficiency of a real heat engine is always 100 percent.
IV. The Carnot engine is a theoretical engine with maximum possible efficiency.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) II, III and IV
(C) I and II
(D) III and IV
(E) Answer not known

16. The most appropriate reason why the efficiency of a Carnot engine operating between any two finite temperatures can never reach 100% is:
(A) Mechanical friction between the moving parts of the engine cannot be entirely eliminated.
(B) The working substance inevitably loses heat through radiation to the cooler surroundings.
(C) Isothermal expansion processes require an infinite amount of time to occur in practice.
(D) The cold reservoir temperature cannot be reduced to absolute zero.
(E) Answer not known

17. Arrange the four fundamental processes of an ideal Carnot cycle in the correct chronological order starting from the high-temperature state:
I. Adiabatic expansion
II. Isothermal expansion
III. Adiabatic compression
IV. Isothermal compression
(A) II, I, IV, III
(B) I, II, III, IV
(C) II, IV, I, III
(D) IV, III, II, I
(E) Answer not known

18. What defines the coefficient of performance (COP) of a refrigerator?
(A) Ratio of the work done by the system to the heat extracted from the cold reservoir.
(B) Ratio of the heat rejected to the hot reservoir to the work done on the system.
(C) Ratio of the heat extracted from the cold reservoir to the work done on the system.
(D) Ratio of the heat extracted from the cold reservoir to the heat rejected to the hot reservoir.
(E) Answer not known

19. Based on the working principle of a room air conditioner, what can be inferred if it is left running with its door open in a perfectly insulated closed room?
(A) The room temperature will gradually increase.
(B) The room temperature will drop significantly.
(C) The room temperature will remain the same.
(D) The room will reach absolute zero quickly.
(E) Answer not known

20. Which classification of thermodynamic processes requires the system's temperature to remain strictly constant?
(A) Isobaric process
(B) Isochoric process
(C) Adiabatic process
(D) Isothermal process
(E) Answer not known

21. Match the items in List I with those in List II:
List I: (Refrigerator Component)
P. Compressor
Q. Condenser coils
R. Expansion valve
S. Evaporator
List II: (Function)
I. Absorbs heat from the inside of the

NODIA

(B) Metals undergo lower thermal expansion compared to wood.
(C) Metals have high thermal conductivity and bakelite acts as an insulator.
(D) Metals absorb more radiation than wood.
(E) Answer not known

7. Select the option that correctly sequences the following materials in decreasing order of their thermal conductivity.
(A) Silver, Copper, Aluminium, Glass
(B) Copper, Silver, Glass, Aluminium
(C) Glass, Aluminium, Copper, Silver
(D) Silver, Aluminium, Copper, Glass
(E) Answer not known

8. The amount of heat required to raise the temperature of a unit mass of a substance by one degree Celsius is defined as:
(A) Specific heat capacity
(B) Thermal capacity
(C) Latent heat
(D) Water equivalent
(E) Answer not known

9. Consider the following statements regarding Calorimetry and its principles:
I. Calorimetry is the science of measuring the amount of heat involved in a chemical or physical process.
II. A calorimeter works on the principle of conservation of energy.
III. Heat lost by the hot body is equal to heat gained by the cold body, assuming no heat loss to surroundings.
IV. Water is strictly avoided in calorimeters due to its high specific heat capacity.
V. The mixing method is widely used to determine the specific heat capacity of solids and liquids.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, II and III
(D) I, III and IV
(E) Answer not known

10. Which of the following statements about the anomalous expansion of water is incorrect?
(A) Water contracts when heated from 0 degrees Celsius to 4 degrees Celsius.
(B) The density of water is maximum at exactly 0 degrees Celsius.
(C) This property allows aquatic life to survive in frozen lakes.
(D) Above 4 degrees Celsius, water expands upon heating like normal liquids.
(E) Answer not known

11. Match the items in List I with those in List II:
List I: (Law of Thermodynamics)
P. Zeroth law of thermodynamics
Q. First law of thermodynamics
R. Second law of thermodynamics
S. Third law of thermodynamics
List II: (Core Concept)
I. Law of conservation of energy
II. Concept of thermal equilibrium and temperature
III. Entropy of a perfect crystal approaches zero at absolute zero
IV. Direction of heat flow and concept of entropy
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

12. Which of the following materials is an exception and does NOT undergo cubical expansion uniformly upon heating from room temperature?
(A) Aluminium
(B) Iron
(C) Rubber
(D) Copper
(E) Answer not known

13. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): A bimetallic strip bends upon heating.
Reason (R): Different metals have different coefficients of linear expansion.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

Downloaded from www.pdf.tube

CHAPTER 05

Heat, Nuclear Physics, Laser, Electronics and Communications

NODIA

1. Match the items in List I with those in List II:
List I: (Thermometer Type)
P. Clinical thermometer
Q. Pyrometer
R. Bimetallic thermometer
S. Platinum resistance thermometer
List II: (Application/Principle)
I. Measures temperature by electrical resistance changes
II. Measures high temperatures using thermal radiation
III. Uses a constriction to prevent mercury backflow
IV. Utilizes differential thermal expansion of metals
(A) P-II, Q-III, R-I, S-IV
(B) P-III, Q-II, R-IV, S-I
(C) P-III, Q-I, R-IV, S-II
(D) P-IV, Q-II, R-III, S-I
(E) Answer not known

2. At what specific temperature do the Celsius and Fahrenheit scales read the exact same numerical value?
(A) -273.15 degrees
(B) -40 degrees
(C) 0 degrees
(D) 100 degrees
(E) Answer not known

3. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): At high altitudes, such as in the Nilgiris of Tamil Nadu, water boils at a temperature lower than 100 degrees Celsius.
Reason (R): The atmospheric pressure increases as the altitude increases, thereby lowering the boiling point.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

4. Identify the incorrectly matched pair regarding the modes of heat transfer.
(A) Conduction - Heat transfer through direct physical contact between particles.
(B) Convection - Heat transfer by the actual mass motion of a fluid.
(C) Thermal conductivity - The ability of a material to conduct heat.
(D) Radiation - Heat transfer requiring a material medium like solid or liquid.
(E) Answer not known

5. Consider the following statements about conduction and thermal conductivity:
I. Metals are generally good conductors of heat due to the presence of free electrons.
II. Wood and air are poor conductors of heat and act as thermal insulators.
III. In steady-state conduction, the temperature of every part of the conducting rod increases continuously over time.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I only
(D) III only
(E) Answer not known

6. A cooking vessel is usually made of a metal like copper or aluminium, while its handle is made of bakelite or wood. This application relies on the concept that:
(A) Metals have high specific heat capacity and bakelite has low specific heat capacity.

refrigerator
II. Increases pressure and temperature of the refrigerant vapour
III. Releases heat absorbed to the surrounding environment
IV. Reduces pressure causing the refrigerant to cool rapidly
(A) P-II, Q-III, R-IV, S-I
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-II, R-I, S-IV
(D) P-I, Q-III, R-II, S-IV
(E) Answer not known

22. Which among the following is the most significant greenhouse gas contributing to the enhanced global greenhouse effect?
(A) Nitrogen
(B) Argon
(C) Carbon dioxide
(D) Oxygen
(E) Answer not known

23. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): Greenhouse effect is a naturally occurring phenomenon that is essential for keeping the Earth's surface warm.
Reason (R): Without greenhouse gases, the average temperature of the Earth would be below freezing.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

24. Identify the incorrectly matched pair regarding global warming impacts.
(A) Thermal expansion of oceans - Reduction in overall volume of seawater
(B) Melting glaciers - Rise in global sea levels
(C) Ocean acidification - Decrease in ocean pH due to carbon dioxide absorption
(D) Extreme weather - Increased frequency of heatwaves and intense cyclones
(E) Answer not known

25. Consider the following statements regarding specific heat capacity:
I. Specific heat capacity depends on the nature of the material.
II. Specific heat capacity of water is very low, making it a poor coolant.
III. It is expressed in the SI unit of J/kg.K.
Which of the above statement(s) is/are correct?
(A) I and III
(B) I and II
(C) I only
(D) II only
(E) Answer not known

26. Which of the following is the primary mechanism by which greenhouse gases cause the atmosphere to warm?
(A) They absorb and trap all incoming shortwave solar radiation within the troposphere.
(B) They reflect outgoing infrared radiation back to the Earth's surface.
(C) They generate significant thermal energy through chemical reactions in the ozone layer.
(D) They increase the thermal conductivity of the lower atmosphere and the Earth's crust.
(E) Answer not known

27. Select the correct sequence of the following atmospheric gases arranged in decreasing order of their typical contribution to the natural greenhouse effect.
(A) Carbon dioxide, Water vapour, Methane, Ozone
(B) Water vapour, Carbon dioxide, Methane, Ozone
(C) Methane, Carbon dioxide, Water vapour, Ozone
(D) Carbon dioxide, Methane, Water vapour, Ozone
(E) Answer not known

28. Identify the correct statement regarding the Kelvin-Planck formulation of the second law of thermodynamics.
(A) It is impossible to construct an engine that operates in a cycle and produces no other effect than the transfer of heat from a cooler body to a hotter body.
(B) The entropy of the universe is constant in any spontaneous process.

Click Here to Buy book on Amazon

(C) It is impossible for a heat engine working in a cyclic process to extract heat from a hot reservoir and convert it entirely into work.
(D) Heat can spontaneously flow from a colder body to a hotter body.
(E) Answer not known

29. Consider the following statements about thermodynamic cycles:
I. Reversible processes yield the maximum theoretical work.
II. All natural processes are generally irreversible.
III. Entropy is a measure of the disorder of a system.
IV. In an isolated system, entropy always decreases.
V. The Clausius statement is directly related to the operation of a refrigerator.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) I, II, IV and V
(C) I, III and V
(D) II, IV and V
(E) Answer not known

30. Which of the following statements regarding thermal expansion is incorrect?
(A) Coefficient of cubical expansion is generally three times the coefficient of linear expansion.
(B) Gasses expand much more than solids and liquids for the same rise in temperature.
(C) Invar steel is used in making pendulum clocks due to its high coefficient of thermal expansion.
(D) Water pipes may burst in cold countries because water expands upon freezing.
(E) Answer not known

31. Match the items in List I with those in List II:
List I: (Subatomic Particle / Concept)
P. Electron
Q. Proton
R. Neutron
S. Nucleus
List II: (Discoverer / Characteristic)
I. Discovered by James Chadwick
II. Central dense core discovered by Rutherford
III. Negatively charged particle discovered by J.J. Thomson
IV. Positively charged particle observed in anode rays
(A) P-III, Q-IV, R-I, S-II
(B) P-III, Q-I, R-IV, S-II
(C) P-II, Q-IV, R-I, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

32. Which of the following is NOT a correct feature of isotopes?
(A) They are atoms of the same element with the same atomic number.
(B) They have different mass numbers due to differing numbers of neutrons.
(C) Isotopes of hydrogen include protium, deuterium, and tritium.
(D) They exhibit entirely different chemical properties from one another.
(E) Answer not known

33. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): Gamma rays have the highest penetrating power among radioactive emissions.
Reason (R): Gamma rays are uncharged, high-frequency electromagnetic waves with zero rest mass.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

34. Identify the correctly matched pair regarding radioactivity units.
(A) Becquerel - Equal to one million disintegrations per second
(B) Rutherford - Equal to one disintegration per second
(C) Curie - Number of disintegrations equivalent to 1 gram of Radium
(D) Roentgen - Unit measuring the half-life of a radioactive sample
(E) Answer not known

35. Consider the following statements about Alpha decay:

NODIA

I. An alpha particle is identical to a helium nucleus containing two protons and two neutrons.
II. Emission of an alpha particle decreases the atomic number by two.
III. Emission of an alpha particle decreases the mass number by two.
IV. Alpha particles have a highly ionizing nature compared to beta and gamma rays.

Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) II, III and IV
(C) I and II
(D) I and IV
(E) Answer not known

36. Which of the following best defines "mass defect" in nuclear physics?
(A) The missing mass that converts entirely into the kinetic energy of the orbiting electrons in an atom.
(B) The total reduction in the atomic number during the process of spontaneous alpha decay in a sample.
(C) The specific excess mass of a neutron compared to a proton inside a stable and non-radioactive nucleus.
(D) The mass difference between nucleons and the actual nucleus.
(E) Answer not known

37. Arrange the following radiations in increasing order of their ionizing power:
I. Alpha particles
II. Beta particles
III. Gamma rays
(A) III, II, I
(B) I, II, III
(C) II, I, III
(D) III, I, II
(E) Answer not known

38. The mass number of an atomic nucleus is defined strictly as:
(A) The total number of protons found within the atomic nucleus.
(B) The total combined mass of protons, neutrons, and electrons.
(C) The sum of protons and neutrons in the nucleus.
(D) The ratio of protons to neutrons in a stable isotope.
(E) Answer not known

39. What can be inferred about the daughter nucleus when a radioactive parent nucleus undergoes a beta-minus emission?
(A) The mass number of the nucleus increases by exactly one unit.
(B) The atomic number of the nucleus decreases by exactly one unit.
(C) The nucleus transforms into a stable isotope of the same element.
(D) The atomic number increases by one with no mass change.
(E) Answer not known

40. According to the nuclear shell model, which classification correctly describes "magic numbers" (e.g., 2, 8, 20, 28, 50, 82, 126)?
(A) Numbers of nucleons that confer exceptional stability to a nucleus
(B) Numbers of electrons required for a perfectly conducting atom
(C) The optimal number of control rods needed in a fast breeder reactor
(D) The atomic numbers of transuranic elements synthesized in laboratories
(E) Answer not known

41. Match the items in List I with those in List II:
List I: (Nuclear Reactor Component)
P. Moderator
Q. Control rods
R. Coolant
S. Nuclear Fuel
List II: (Specific Material Used)
I. Enriched Uranium-235
II. Heavy water or Graphite
III. Cadmium or Boron
IV. Liquid sodium or Normal water
(A) P-II, Q-III, R-IV, S-I
(B) P-III, Q-II, R-I, S-IV
(C) P-IV, Q-I, R-II, S-III
(D) P-II, Q-IV, R-III, S-I
(E) Answer not known

42. Which nuclear reaction serves as the primary energy source of the Sun and other stars?
(A) Spontaneous fission of heavy Uranium isotopes
(B) Fusion of hydrogen into helium

NODIA

(C) Alpha decay of heavy elements like Uranium
(D) Chain reaction involving Plutonium-239
(E) Answer not known

43. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): In a nuclear reactor, heavy water is preferred over ordinary water as a moderator.
Reason (R): Heavy water has a lower probability of absorbing neutrons compared to ordinary water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

44. Identify the incorrectly matched pair regarding nuclear facilities in India.
(A) Tarapur - Maharashtra
(B) Kudankulam - Tamil Nadu
(C) Kalpakkam - Kerala
(D) Kaiga - Karnataka
(E) Answer not known

45. Consider the following statements about a nuclear chain reaction:
I. It occurs when neutrons released during fission trigger further fission reactions.
II. Critical mass is the minimum amount of fissile material needed to maintain a self-sustaining chain reaction.
III. An uncontrolled chain reaction forms the basis of a nuclear reactor.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I only
(D) III only
(E) Answer not known

46. Nuclear fusion requires extremely high temperatures (thermonuclear conditions). This is primarily to:
(A) Evaporate the electrons completely from the orbits of the atoms.
(B) Increase the mass of hydrogen nuclei to facilitate nuclear binding.
(C) Overcome electrostatic repulsion between nuclei.
(D) Activate the strong nuclear force at significantly larger distances.
(E) Answer not known

47. Select the correct sequence of steps occurring during the generation of electricity in a typical Pressurized Water Reactor (PWR).
(A) Heat generation in core → Steam generation in secondary loop → Turbine rotation → Electricity generation
(B) Steam generation in core → Turbine rotation → Heat transfer to secondary loop → Electricity generation
(C) Turbine rotation → Core heat absorption → Condenser cooling → Electricity generation
(D) Core expansion → Coolant evaporation → Generator induction → Heat generation
(E) Answer not known

48. Identify the correct difference between nuclear fission and nuclear fusion.
(A) Fission leaves no radioactive waste, whereas fusion produces highly toxic and long-lived radioactive waste.
(B) Fission involves combining light nuclei, whereas fusion involves splitting a heavy nucleus into lighter parts.
(C) Fission generates energy by increasing the total mass, whereas fusion relies on mass-energy conservation laws.
(D) Fission powers reactors, whereas fusion occurs in stars.
(E) Answer not known

49. Consider the following statements regarding safety and working of nuclear reactors:
I. Containment structures are made of thick concrete and steel to prevent radiation leaks.
II. Control rods are fully inserted to immediately halt the reactor during an emergency (SCRAM).
III. Coolant transfers the heat away from the reactor core.
IV. Fast breeder reactors use moderators extensively to slow down neutrons.
V. India's three-stage nuclear power programme aims to eventually utilize its vast thorium reserves.

Downloaded from www.pdf.tube

Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) I, II, IV and V
(C) II, III and IV
(D) I, III and V
(E) Answer not known

50. Which of the following statements about nuclear power in Tamil Nadu is incorrect?
(A) Kudankulam was established with technical assistance provided by Russia.
(B) The Madras Atomic Power Station (MAPS) is located at Kalpakkam.
(C) Kudankulam uses Boiling Water Reactors (BWR).
(D) MAPS is the first fully indigenously constructed nuclear power station.
(E) Answer not known

51. Match the items in List I with those in List II:
List I: (Nuclear Isotope)
P. Carbon-14
Q. Iodine-131
R. Cobalt-60
S. Phosphorus-32
List II: (Field of Application)
I. Used in agricultural research as a tracer
II. Used to treat hyperthyroidism and thyroid cancer
III. Used extensively in cancer radiation therapy
IV. Used in determining the age of ancient organic fossils
(A) P-IV, Q-II, R-III, S-I
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-II, R-IV, S-I
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

52. Which of the following elements is NOT typically considered a primary fertile material in nuclear physics?
(A) Thorium-232
(B) Uranium-238
(C) Uranium-235
(D) None of the above
(E) Answer not known

53. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:

NODIA

Assertion (A): Radioactive carbon dating cannot be accurately used to determine the age of dinosaur fossils.
Reason (R): The half-life of Carbon-14 is only about 5730 years, rendering it ineffective for dating objects millions of years old.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

54. Identify the incorrectly matched pair regarding nuclear weapons and policies.
(A) Hydrogen bomb - Thermonuclear weapon requiring a fission trigger
(B) NPT - Non-Proliferation Treaty aimed at preventing the spread of nuclear weapons
(C) Atomic bomb - Works entirely on the principle of nuclear fusion
(D) CTBT - Comprehensive Nuclear-Test-Ban Treaty prohibiting all nuclear explosions
(E) Answer not known

55. Consider the following statements about radioactive waste management:
I. Low-level waste consists mostly of tools and protective clothing contaminated with radiation.
II. High-level waste contains highly radioactive fission products needing deep geological disposal.
III. Spent nuclear fuel is completely harmless once removed from the reactor core.
IV. Vitrification is a method of stabilizing high-level radioactive waste into glass.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) II, III and IV
(C) I and II
(D) I and III
(E) Answer not known

56. What is the most significant advantage of utilizing a Fast Breeder Reactor (FBR) in India's nuclear program?
(A) It generates more fissile material than it consumes.
(B) It requires highly enriched uranium which is cheap.

I. Farad
II. Ohm
III. Hertz
IV. Henry
(A) P-II, Q-I, R-IV, S-III
(B) P-II, Q-IV, R-I, S-III
(C) P-I, Q-II, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

102. Which of the following is the fundamental necessity for modulating a low-frequency baseband signal before transmission?
(A) To decrease the speed of the signal to prevent any data distortion.
(B) To increase the electrical resistance of the transmitting wire.
(C) To reduce the required antenna height.
(D) To convert analog data strictly into a compressed digital format.
(E) Answer not known

103. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): In Amplitude Modulation (AM), the amplitude of the high-frequency carrier wave is varied in accordance with the message signal.
Reason (R): AM waves are highly resistant to atmospheric electrical noise compared to Frequency Modulation (FM).
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

104. Identify the correctly matched pair regarding types of modulation.
(A) Phase of the carrier varies with the signal.
(B) Amplitude Modulation - Carrier frequency changes with the incoming message signal.
(C) Frequency Modulation - Carrier amplitude changes with the incoming message signal.
(D) Pulse Code Modulation - An entirely analog modulation technique used for radio.
(E) Answer not known

105. Consider the following statements regarding the role of capacitors:
I. Capacitors block the flow of direct current (DC) once fully charged.
II. They easily allow alternating current (AC) to pass through a circuit.
III. They are widely used for filtering in rectifier circuits.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II and III
(D) I, II and III
(E) Answer not known

106. In a communication receiver, the process of demodulation is conceptually applied to:
(A) Amplify the weak incoming carrier signal to a high voltage for audio output.
(B) Recover original signal from the carrier.
(C) Modulate the signal again for further space transmission within the network.
(D) Digitize a continuous analog wave into binary code for computer processing.
(E) Answer not known

107. Select the option that correctly sequences the basic blocks of a general electronic communication system.
(A) Information Source → Transmitter → Communication Channel → Receiver → User
(B) Information Source → Receiver → Communication Channel → Transmitter → User
(C) Transmitter → User → Communication Channel → Receiver → Information Source
(D) User → Communication Channel → Information Source → Receiver → Transmitter
(E) Answer not known

108. Which is the primary function of a transducer in a communication system?
(A) It permanently stores communication data on a high-capacity magnetic disk.
(B) It blocks environmental noise from entering the communication channel.
(C) Converts sound into electrical signals.
(D) It measures the distance between the transmitter and the receiver units.

Click Here to Buy book on Amazon

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

64. Identify the correctly matched pair regarding types of Lasers.
(A) He-Ne Laser - Liquid dye laser used for printing
(B) Semiconductor Laser - High-power gas laser used exclusively for steel cutting
(C) Nd:YAG Laser - Chemical laser utilizing hydrogen fluoride
(D) Ruby Laser - First operational solid-state laser using synthetic ruby
(E) Answer not known

65. Consider the following statements about the applications of Lasers:
I. Lasers are used in optical fibre communication for transmitting high-speed data.
II. In the medical field, lasers are used for precision surgeries like LASIK eye surgery.
III. Lasers cannot be utilized in surveying or measuring long distances due to atmospheric dispersion.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I only
(D) III only
(E) Answer not known

66. How does barcode scanning predominantly apply the principles of Laser technology?
(A) The laser beam permanently alters the printed ink patterns to store new pricing and inventory data.
(B) The laser cuts through the paper or packaging to identify and measure specific product dimensions.
(C) Decodes reflected light variations from the beam.
(D) The high-power lasers measure the exact mass of the scanned item to determine the final pricing.
(E) Answer not known

67. Select the correct sequence of events necessary to achieve laser action in an active medium.
(A) Pumping → Population Inversion → Stimulated Emission
(B) Stimulated Emission → Pumping → Population Inversion
(C) Population Inversion → Spontaneous Emission → Pumping
(D) Pumping → Stimulated Absorption → Spontaneous Divergence
(E) Answer not known

68. Identify the correct expanded form of the acronym LASER.
(A) Light Amplification by Spontaneous Emission of Radiation
(B) Light Absorption by Stimulated Energy Resonance
(C) Light Amplification by Standard Emission of Rays
(D) Light Amplification by Stimulated Emission of Radiation
(E) Answer not known

69. Consider the following statements regarding the fundamental physics of Lasers:
I. The presence of a metastable state is crucial for achieving population inversion.
II. In a metastable state, electrons remain for a longer duration compared to a normal excited state.
III. Photons emitted via stimulated emission are perfectly in phase with the incident photon.
IV. An optical resonator (mirrors) provides positive feedback for light amplification.
V. Gas lasers generally produce light with poorer coherence than normal incandescent bulbs.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III, IV and V
(D) I, II and IV
(E) Answer not known

70. Which of the following statements about LIDAR is incorrect?
(A) LIDAR is an acronym for Light Detection and Ranging used in scanning.
(B) It is used in high-resolution mapping systems and autonomous vehicles.

NODIA

base stations.

Which of the above statement(s) is/are correct?

(A) I, II and III
(B) II, III and IV
(C) I and III
(D) I, II and IV
(E) Answer not known

116. What is the most accurate description of a "transponder" in satellite communication?

(A) The solar panels providing electrical power to the satellite components.
(B) The rocket engine used to adjust the satellite's orbital position in space.
(C) A camera module taking high-resolution images of the Earth's surface area.
(D) Receives, amplifies, and retransmits signals.
(E) Answer not known

117. Arrange the following parts of the electromagnetic spectrum in decreasing order of their wavelength:

I. Microwaves
II. Radio waves
III. Visible light
IV. X-rays

(A) II, I, III, IV
(B) IV, III, I, II
(C) I, II, III, IV
(D) II, III, I, IV
(E) Answer not known

118. In satellite communication, the term "footprint" specifically defines:

(A) The physical dimension of the satellite dish located on the ground.
(B) The carbon emissions produced during the satellite's launch phase.
(C) Earth area illuminated by the signal beam.
(D) The track path of the rocket left in the atmosphere during ascent.
(E) Answer not known

119. By comparing polar satellites and geostationary satellites, one can clearly infer that:

(A) Polar satellites orbit at altitudes higher than geostationary satellites.
(B) Geostationary satellites sweep over the poles multiple times every day.
(C) Polar satellites are exclusively used for direct-to-home TV broadcasts.
(D) Polar satellites monitor global weather.
(E) Answer not known

120. Which communication technique allows multiple distinct signals to be transmitted simultaneously over a single shared medium without interference?

(A) Multiplexing
(B) Modulation
(C) Amplification
(D) Rectification
(E) Answer not known

121. Match the items in List I with those in List II:

List I: (Internet Protocol / Concept)

P. HTTP
Q. FTP
R. IP
S. SMTP

List II: (Core Function)

I. Responsible for routing data packets across network boundaries
II. Used to transfer and view web pages on the World Wide Web
III. Standard protocol for sending email messages
IV. Used for the transfer of computer files between a client and server

(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-I, S-III
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

122. The fundamental physical principle governing the transmission of light signals through an optical fibre is:

(A) Optical dispersion
(B) Total internal reflection
(C) Diffraction of light
(D) Refraction through a prism
(E) Answer not known

123. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:

Assertion (A): In an optical fibre, light travels through the core with virtually no loss through the cladding.

Reason (R): The refractive index of the core

Downloaded from www.pdf.tube

(E) Answer not known

78. In a P-N junction, the "depletion region" is specifically defined as:
(A) The heavily doped region that conducts maximum current.
(B) The metallic contact points connecting the diode to the circuit.
(C) The area near the junction devoid of mobile charge carriers.
(D) The boundary layer where only electrons can reside permanently.
(E) Answer not known

79. From the working of a full-wave rectifier circuit using diodes, what can be fundamentally inferred?
(A) It transforms direct current into alternating current with high efficiency levels.
(B) It uses both AC halves to produce a DC output.
(C) It completely eliminates the need for any transformer within an electronic circuit.
(D) It amplifies the voltage levels of the input signal significantly during operation.
(E) Answer not known

80. Based on classification, which of the following devices is an optoelectronic semiconductor?
(A) Zener diode
(B) Field Effect Transistor (FET)
(C) Bipolar Junction Transistor (BJT)
(D) Light Emitting Diode (LED)
(E) Answer not known

81. Match the items in List I with those in List II:
List I: (Transistor Terminal)
P. Emitter
Q. Base
R. Collector
S. Gate
List II: (Key Function/Characteristic)
I. Very thin and lightly doped central region
II. Heavily doped region that supplies majority charge carriers
III. Moderately doped region that collects charge carriers
IV. Terminal controlling the current flow in a Field Effect Transistor (FET)
(A) P-II, Q-I, R-III, S-IV
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-III, R-I, S-IV
(D) P-III, Q-I, R-II, S-IV
(E) Answer not known

82. Which foundational semiconductor material revolutionized the modern electronics industry by replacing bulky vacuum tubes?
(A) Germanium
(B) Gallium Arsenide
(C) Silicon
(D) Indium Phosphide
(E) Answer not known

83. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): A transistor is widely used as a basic building block for amplifiers in electronics.
Reason (R): A small change in the base current of a transistor causes a large change in the collector current.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

84. Identify the correctly matched pair regarding Integrated Circuit (IC) generation.
(A) SSI - Large Scale Integration
(B) MSI - Micro Scale Integration
(C) ULSI - Universal Local Scale Integration
(D) VLSI - Very Large Scale Integration
(E) Answer not known

85. Consider the following statements about transistors:
I. BJT stands for Bipolar Junction Transistor.
II. In an NPN transistor, the current conduction is purely due to holes.
III. Transistors act as excellent electronic switches in digital logic circuits.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

NODIA

(C) It relies on radio waves to measure distances.
(D) It measures the time taken for a laser pulse to reflect back to the sensor.
(E) Answer not known

71. Match the items in List I with those in List II:
List I: (Semiconductor Material / Term)
P. Intrinsic semiconductor
Q. Extrinsic semiconductor
R. N-type dopant
S. P-type dopant
List II: (Definition / Example)
I. Pure semiconductor like Silicon without impurities
II. Phosphorus or Arsenic (Pentavalent)
III. Boron or Gallium (Trivalent)
IV. Doped semiconductor with altered conductivity
(A) P-I, Q-IV, R-II, S-III
(B) P-IV, Q-I, R-III, S-II
(C) P-I, Q-II, R-IV, S-III
(D) P-IV, Q-III, R-I, S-II
(E) Answer not known

72. Which of the following is NOT a characteristic property of a semiconductor?
(A) At absolute zero temperature, it behaves as a perfect conductor.
(B) Its electrical conductivity lies between that of a conductor and an insulator.
(C) It possesses a negative temperature coefficient of resistance.
(D) Its conductivity can be significantly increased by adding minute impurities.
(E) Answer not known

73. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): Adding a pentavalent impurity to silicon creates an n-type semiconductor.
Reason (R): The pentavalent atom contributes an extra electron that becomes a majority charge carrier.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

74. Identify the incorrectly matched pair regarding electronic components.
(A) Resistor - An electrical component that opposes the flow of electric current in a circuit.
(B) Inductor - Restricts DC while passing AC freely.
(C) Capacitor - An electrical component that stores energy in a static electrostatic field.
(D) Diode - A component that allows electrical current to flow in only one primary direction.
(E) Answer not known

75. Consider the following statements about a P-N junction diode:
I. In forward bias, the positive terminal of the battery is connected to the P-type region.
II. Forward biasing reduces the width of the depletion layer.
III. In reverse bias, the diode conducts a large amount of forward current.
IV. An ideal diode acts as a perfect switch.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) II, III and IV
(C) I and II
(D) I and III
(E) Answer not known

76. What is the most appropriate primary application of a Zener diode in an electronic circuit?
(A) Amplification of weak audio signals
(B) Converting alternating current into direct current
(C) Voltage regulation in power supplies
(D) Emitting light when forward-biased
(E) Answer not known

77. Arrange the following materials in the correct increasing order of their typical energy band gap:
I. Conductors
II. Insulators
III. Semiconductors
(A) I, III, II
(B) I, II, III
(C) II, III, I
(D) III, I, II

Click Here to Buy book on Amazon

data.
Reason (R): Digital electronic circuits operate primarily in two discrete voltage levels representing HIGH and LOW states.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

94. Identify the incorrectly matched pair regarding digital data units.
(A) Bit - A single binary digit representing either a 0 or a 1 state in digital logic.
(B) Nibble - A specific group of 4 bits used to represent a single hexadecimal digit.
(C) Word - Exactly 10 bits in all processors.
(D) Byte - A standard group of 8 bits used to encode a single character of text data.
(E) Answer not known

95. Consider the following statements about logic operations:
I. The output of an AND gate is HIGH only when all its inputs are HIGH.
II. The output of an OR gate is LOW only when all its inputs are LOW.
III. The NOT gate is a multi-input logic gate that reverses logic states.
IV. A NOR gate followed by a NOT gate performs the OR operation.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) II, III and IV
(D) I and II
(E) Answer not known

96. What is the most appropriate digital application of an XOR (Exclusive-OR) gate?
(A) Acting as a high-fidelity audio amplifier in home systems.
(B) Storing permanent and non-volatile memory in silicon ROM chips.
(C) Rectifying AC voltage to DC voltage in power supply circuits.
(D) Binary addition in half-adder components.
(E) Answer not known

97. Arrange the following decimal numbers in increasing order of their binary string length (number of bits required to represent them in pure binary):
I. 7
II. 2
III. 16
IV. 11
(A) II, I, IV, III
(B) I, II, III, IV
(C) II, IV, I, III
(D) I, III, II, IV
(E) Answer not known

98. In digital electronics, how is a truth table strictly defined?
(A) A comprehensive list of all historical voltage levels recorded in a functioning microchip.
(B) A physical circuit board layout mapping all necessary resistor and capacitor values.
(C) Table showing all logic inputs and outputs.
(D) An algorithm used exclusively for analog frequency modulation and signal processing.
(E) Answer not known

99. If a logic gate outputs 1 when its two inputs are different (e.g., 0-1 or 1-0) and outputs 0 when its inputs are the same, it can be inferred that the gate is a(n):
(A) XOR gate
(B) AND gate
(C) OR gate
(D) XNOR gate
(E) Answer not known

100. Based on electronic component classification, which of the following is considered an active component?
(A) Resistor
(B) Inductor
(C) Capacitor
(D) Transistor
(E) Answer not known

101. Match the items in List I with those in List II:
List I: (Electronic Component)
P. Resistor
Q. Capacitor
R. Inductor
S. Frequency
List II: (Primary Unit of Measurement)

Downloaded from www.pdf.tube

86. How does Moore's Law conceptually apply to the advancement of integrated circuits?
(A) It dictates that the size of a silicon wafer must double every year to maintain production.
(B) It states that current is directly proportional to voltage in a microscopic integrated circuit.
(C) The transistor count doubles every two years.
(D) It implies that quantum computing will replace silicon-based processors by a specific target date.
(E) Answer not known

87. Select the option that correctly sequences the basic stages of semiconductor IC fabrication.
(A) Wafer preparation → Photolithography → Doping/Etching → Packaging
(B) Packaging → Doping/Etching → Photolithography → Wafer preparation
(C) Photolithography → Packaging → Wafer preparation → Doping/Etching
(D) Doping/Etching → Wafer preparation → Packaging → Photolithography
(E) Answer not known

88. Identify the correct statement detailing a key feature of an ideal Operational Amplifier (Op-Amp).
(A) It has infinite voltage gain.
(B) It has zero input impedance.
(C) It has infinite output impedance.
(D) It perfectly conducts direct current backwards.
(E) Answer not known

89. Consider the following statements about Integrated Circuits (ICs):
I. ICs integrate passive components like resistors and active components like transistors on a single chip.
II. They drastically reduce the size and weight of electronic devices.
III. The primary material used for manufacturing commercial IC substrates is copper.
IV. Jack Kilby is credited with co-inventing the first working integrated circuit.
V. Monolithic ICs are formed on a single single-crystal semiconductor block.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V
(B) II, III, IV and V
(C) I, III and V
(D) I, II and IV
(E) Answer not known

90. Which of the following statements differentiating BJT and FET is incorrect?
(A) BJT is a bipolar device whereas FET is a unipolar device.
(B) FET typically has a much lower input impedance compared to BJT.
(C) BJT is controlled by input current whereas FET is controlled by input voltage.
(D) FETs are predominantly used in modern dense integrated circuits like microprocessors.
(E) Answer not known

91. Match the items in List I with those in List II:
List I: (Logic Gate)
P. AND Gate
Q. OR Gate
R. NOT Gate
S. NAND Gate
List II: (Boolean Expression / Property)
I. $Y = A + B$
II. $Y = A \cdot B$
III. $Y = \text{Invert}(A)$
IV. Universal Gate
(A) P-II, Q-I, R-III, S-IV
(B) P-I, Q-II, R-IV, S-III
(C) P-II, Q-III, R-I, S-IV
(D) P-IV, Q-I, R-III, S-II
(E) Answer not known

92. Which among the following gates is NOT considered a Universal Logic Gate?
(A) NAND gate
(B) NOR gate
(C) XOR gate
(D) None of the above (Both A and B are universal)
(E) Answer not known

93. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): The binary number system uses only two distinct digits, 0 and 1, to represent

NODIA

(E) Answer not known

109. Consider the following statements about electronic components:
I. The colour code on a resistor indicates its resistance value and tolerance.
II. Inductors store energy in the form of a magnetic field.
III. A transformer operates effectively on direct current (DC).
IV. Diodes are essential components in AC to DC rectification.
V. Capacitors in series increase the total equivalent capacitance.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) II, III and V
(C) I, III and IV
(D) I, II, IV and V
(E) Answer not known

110. Which statement regarding wave propagation in communication is incorrect?
(A) Ground wave propagation is suitable only for low and medium frequencies in radio.
(B) Sky wave propagation relies on reflection from the Earth's ionized ionosphere.
(C) Microwaves rely on ground wave propagation.
(D) Space wave propagation involves line-of-sight communication like TV broadcasts.
(E) Answer not known

111. Match the items in List I with those in List II:
List I: (Mobile Communication Generation)
P. 1G
Q. 2G
R. 3G
S. 4G
List II: (Key Technological Feature)
I. Introduced mobile internet and video calling capabilities
II. Introduced digital voice and SMS (e.g., GSM technology)
III. All-IP packet-switched network with high-speed broadband (LTE)
IV. Purely analog voice communication
(A) P-IV, Q-II, R-I, S-III
(B) P-II, Q-IV, R-I, S-III
(C) P-IV, Q-I, R-II, S-III
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

112. Which of the following statements about the FM radio band is NOT true?
(A) It typically operates in the VHF range for standard terrestrial broadcasting.
(B) The standard FM broadcast band lies between 88 MHz and 108 MHz worldwide.
(C) It is less susceptible to electrical interference compared to AM radio waves.
(D) It reflects off the ionosphere for global use.
(E) Answer not known

113. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): Geostationary satellites appear stationary with respect to a fixed point on the Earth's equator.
Reason (R): Their orbital period is exactly equal to the rotational period of the Earth (approx. 24 hours).
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

114. Identify the incorrectly matched pair regarding satellite orbits.
(A) LEO (Low Earth Orbit) - Used typically for satellite imaging and the ISS station.
(B) MEO (Medium Earth Orbit) - Common for navigation satellites like the GPS system.
(C) Polar Orbit - Over equator for TV broadcast.
(D) GEO (Geostationary Orbit) - Located at an altitude of roughly 36,000 km in space.
(E) Answer not known

115. Consider the following statements about 5G mobile technology:
I. It promises significantly lower latency compared to 4G LTE.
II. It utilizes millimeter-wave frequencies for ultra-fast data transfer.
III. It supports massive machine-type communications suitable for IoT.
IV. It completely abandons the use of cellular

Click Here to Buy book on Amazon

(C) It eliminates the need for complex cooling systems.
(D) It works on cold fusion without generating heat.
(E) Answer not known

57. Arrange the following stages of India's three-stage nuclear power programme in correct order:
I. Utilization of Thorium-232 and Uranium-233 in Advanced Heavy Water Reactors
II. Construction of Pressurized Heavy Water Reactors (PHWRs) using natural uranium
III. Utilization of Plutonium-239 in Fast Breeder Reactors
(A) II, III, I
(B) I, II, III
(C) III, II, I
(D) II, I, III
(E) Answer not known

58. The fundamental concept of "half-life" in radioactive decay is defined as:
(A) The exact time taken for a radioactive source to completely disappear from existence.
(B) The time required for half of the sample's nuclei to decay.
(C) The duration a nucleus remains in a metastable state before emitting any radiation.
(D) The time needed to extract fuel from a nuclear reactor during a maintenance cycle.
(E) Answer not known

59. What can be inferred about the risk to human health when exposed to acute, high-level ionizing radiation?
(A) It causes DNA damage and radiation syndrome.
(B) It permanently boosts the immune system cells.
(C) It results in temporary skin burns exclusively.
(D) The effects are negligible with good hydration.
(E) Answer not known

60. Based on international treaties, India's refusal to sign the Nuclear Non-Proliferation Treaty (NPT) is primarily classified under which policy stance?
(A) A desire to legally export nuclear weapons and technology to all neighboring countries.
(B) An inability to understand the complex technical protocols required by the IAEA body.
(C) Viewing the treaty as discriminatory to non-nuclear states.
(D) The belief that nuclear weapons should be mandatory for all UN member states worldwide.
(E) Answer not known

NODIA

61. Match the items in List I with those in List II:
List I: (Term related to Laser)
P. Spontaneous emission
Q. Stimulated emission
R. Population inversion
S. Pumping
List II: (Description)
I. More atoms in the excited state than in the ground state
II. Process of supplying energy to atoms to excite them
III. Random emission of a photon by an excited atom
IV. An incident photon forces an excited atom to emit a matching photon
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-I, S-II
(C) P-III, Q-II, R-I, S-IV
(D) P-I, Q-IV, R-III, S-II
(E) Answer not known

62. Which among the following is NOT an essential characteristic of Laser light?
(A) High monochromaticity
(B) High degree of coherence
(C) Spontaneous divergence
(D) Intense directionality
(E) Answer not known

63. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): A Helium-Neon laser continuously produces a highly directional red beam of light.
Reason (R): Helium atoms undergo population inversion and emit photons while Neon atoms act merely as a cooling agent.

is kept intentionally higher than the refractive index of the cladding.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

124. Identify the correctly matched pair regarding broadband and internet concepts.
(A) Broadband - Dial-up connection with very low data transmission rates
(B) Modem - Primarily acts as a virus scanner for incoming emails
(C) Router - A device that forwards data packets between computer networks
(D) WWW - An internet hardware cable laid across oceans
(E) Answer not known

125. Consider the following statements about optical fibre networks:
I. They offer much higher bandwidth compared to traditional copper cables.
II. Optical signals are immune to electromagnetic interference.
III. They are heavier and much thicker than equivalent copper wires.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

126. When a data packet is sent over the Internet, router systems dynamically apply routing algorithms to:
(A) Convert the data packet into analog radio frequencies for transmission.
(B) Permanently decrypt all passwords contained within the data packet.
(C) Find the best path to the destination IP.
(D) Increase the physical size of the data packet for network visibility.
(E) Answer not known

127. Select the correct sequence of the standard OSI (Open Systems Interconnection) model layers from the bottom (Layer 1) to the top (Layer 7).
(A) Physical → Data Link → Network → Transport → Session → Presentation → Application
(B) Application → Presentation → Session → Transport → Network → Data Link → Physical
(C) Physical → Network → Data Link → Session → Transport → Presentation → Application
(D) Network → Physical → Data Link → Transport → Application → Presentation → Session
(E) Answer not known

128. Identify the correct statement highlighting the primary difference between IPv4 and IPv6 addressing formats.
(A) IPv4 uses 128-bit addresses, while IPv6 uses 32-bit addresses for all network devices.
(B) IPv6 relies exclusively on hardware MAC addresses instead of standard IP structures.
(C) IPv4 provides a practically infinite pool of unique addresses compared to IPv6 range.
(D) IPv4 is numeric; IPv6 is 128-bit hexadecimal.
(E) Answer not known

129. Consider the following statements about optical communication technology:
I. Light emitting diodes (LEDs) or semiconductor lasers act as light sources.
II. Photodiodes are utilized at the receiver end to convert light back to electrical signals.
III. Attenuation (signal loss) in optical fibres is higher than in copper cables.
IV. Silica glass is fundamentally used to manufacture high-quality optical fibres.
V. It is impossible to multiplex multiple light wavelengths in a single fibre.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) II, III and V
(C) I, III, IV and V
(D) I, II, III and IV
(E) Answer not known

130. Which of the following statements incorrectly compares Wi-Fi and Li-Fi technologies?
(A) Wi-Fi utilizes radio waves for high-speed data transmission in local networks.

Downloaded from www.pdf.tube

(B) Li-Fi relies on visible light communication using standard LED light bulbs.
(C) Li-Fi signals penetrate solid opaque walls.
(D) Li-Fi theoretically offers higher data transfer speeds than traditional Wi-Fi.
(E) Answer not known

131. Match the items in List I with those in List II:
List I: (Emerging Technology Area)
P. Quantum Computing
Q. Nanotechnology
R. Artificial Intelligence
S. Internet of Things (IoT)
List II: (Core Concept/Application)
I. Manipulation of matter on an atomic or molecular scale
II. Interconnecting physical everyday devices to send/receive data
III. Utilizing principles of superposition and entanglement for processing
IV. Creating computer systems capable of performing tasks requiring human logic
(A) P-III, Q-I, R-IV, S-II
(B) P-I, Q-III, R-II, S-IV
(C) P-III, Q-II, R-I, S-IV
(D) P-IV, Q-I, R-III, S-II
(E) Answer not known

132. Which of the following is NOT generally recognized as a direct application of nanotechnology?
(A) Targeted drug delivery systems in medicine
(B) Development of ultra-strong, lightweight carbon nanotubes
(C) Sunscreen lotions containing nanoscale titanium dioxide
(D) Creating mechanical macro-turbines for hydroelectric dams
(E) Answer not known

133. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): Quantum computers are theoretically capable of solving certain complex cryptographic problems exponentially faster than classical computers.
Reason (R): A classical bit holds one state (0 or 1), whereas a quantum bit (qubit) can exist in a superposition of multiple states simultaneously.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

134. Identify the incorrectly matched pair concerning emerging tech principles.
(A) Superposition - Qubit existing in multiple states at once
(B) Entanglement - Linked quantum particles instantly affecting each other regardless of distance
(C) Graphene - A three-dimensional bulk block of carbon atoms used in cement
(D) Quantum Supremacy - A quantum computer performing a task impossible for a classical computer
(E) Answer not known

135. Consider the following statements about nanomaterials:
I. A material must have at least one dimension in the range of 1 to 100 nanometers to be considered a nanomaterial.
II. Nanomaterials often exhibit fundamentally different physical and chemical properties than their bulk counterparts.
III. Gold at the nanoscale can appear red or purple instead of its classic metallic yellow.
IV. The surface-area-to-volume ratio in nanomaterials is significantly lower than in bulk materials.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) II, III and IV
(C) I, III and IV
(D) I and II
(E) Answer not known

136. What is the most profound advantage of Quantum Cryptography (e.g., QKD) over classical encryption methods?
(A) Third-party measurement alerts the users.
(B) It requires absolutely no electrical power to run the encryption algorithms.
(C) It uses simple alphabetical substitution ciphers that are truly unbreakable.
(D) It replaces high-speed optical fibres with

standard copper telephone wires.
(E) Answer not known

137. Arrange the following metric prefixes in strictly decreasing order of magnitude:
I. Milli
II. Micro
III. Nano
IV. Pico
(A) I, II, III, IV
(B) IV, III, II, I
(C) I, III, II, IV
(D) II, I, IV, III
(E) Answer not known

138. In the rapidly evolving field of quantum computing, a "qubit" is strictly defined as:
(A) The smallest possible unit of classical silicon-based computer system memory.
(B) Quantum unit existing as 0, 1, or both.
(C) A nanoscale robot used for biological surgeries and diagnostic procedures.
(D) A specific frequency band reserved for future 6G mobile communications.
(E) Answer not known

139. Based on its structure, one can infer that the exceptional electrical and thermal conductivity of Graphene is due to:
(A) Its 2D honeycomb carbon atom lattice.
(B) Its thick, multi-layered insulating crystal lattice structure.
(C) The presence of heavy uranium isotopes embedded in its structure.
(D) Its completely random and amorphous atomic arrangement throughout.
(E) Answer not known

140. Which classification distinguishes the "bottom-up" approach from the "top-down" approach in nanomanufacturing?
(A) Bottom-up involves cutting materials down; top-down builds materials from single atoms.
(B) Bottom-up relies on gravity forces; top-down relies on magnetic forces and fields.
(C) Bottom-up assembles; top-down carves.
(D) Bottom-up is used for quantum computers; top-down is used for large solar panels.
(E) Answer not known

141. Match the items in List I with those in List II:
List I: (Scientist / Inventor)
P. Sadi Carnot
Q. Enrico Fermi
R. Theodore Maiman
S. Tim Berners-Lee
List II: (Key Contribution to Physics/Tech)
I. Built the first functioning Laser
II. Formulated the principles of the ideal heat engine
III. Invented the World Wide Web
IV. Created the first controlled nuclear chain reaction
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-I, S-III
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

142. The SI unit of specific heat capacity is:
(A) Joule per Kelvin unit of measure
(B) Joule per kilogram unit of measure
(C) Joule per kilogram per Kelvin
(D) Watt per square meter of surface
(E) Answer not known

143. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): Evaporation of sweat from the human body causes a cooling effect.
Reason (R): The liquid absorbs latent heat of vaporization from the body surface to change into vapour.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

144. Identify the correctly matched pair regarding heat engines.
(A) Diesel Engine - Spark plug is strictly required for ignition
(B) Carnot Engine - A highly inefficient practical engine used in old cars
(C) Steam Engine - Internal combustion engine
(D) Petrol Engine - Operates on the theoretical

Click Here to Buy book on Amazon

9. (A) I, II, III and V
Calorimetry measures heat exchange during physical or chemical changes based on the law of energy conservation. In an isolated system, the heat lost by a warmer body must equal the heat gained by a cooler body. Water is frequently used in calorimeters specifically because its high specific heat capacity makes it an excellent medium for absorbing large energy changes.

10. (B) The density of water is maximum at exactly 0 degrees Celsius.
Water exhibits a unique behavior known as anomalous expansion where it contracts upon heating from zero to four degrees Celsius. Consequently, the volume of water is at its minimum and its density reaches a maximum value at exactly four degrees Celsius, not zero. This physical property is vital for the survival of aquatic life in sub-zero environmental conditions.

11. (A) P-II, Q-I, R-IV, S-III
The Zeroth Law establishes the concept of temperature through thermal equilibrium. The First Law defines the conservation of energy, relating heat, work, and internal energy. The Second Law introduces entropy and determines the spontaneous direction of heat flow. Finally, the Third Law states that the entropy of a perfect crystal reaches zero as the temperature approaches absolute zero.

12. (C) Rubber
Most metals like aluminum, iron, and copper undergo uniform cubical expansion, meaning their volume increases predictably as temperature rises. Rubber is a polymer with a complex molecular structure that behaves differently; it can actually contract when heated under certain conditions due to the increased entropy and tension of its long-chain molecules. This makes it an exception to standard expansion.

13. (A) Both A and R are true and R is the correct explanation of A.
A bimetallic strip consists of two different metal layers bonded together. Because these metals possess distinct coefficients of linear expansion, they expand by different amounts when subjected to the same temperature change. Since they are physically joined, the strip must bend to accommodate the unequal lengths. This principle is widely utilized in thermostats and various temperature-controlled mechanical switches.

14. (C) Superficial expansion - Increase in area per unit area per degree temperature rise
Superficial expansion refers to the fractional increase in the surface area of a solid when its temperature is raised. It is mathematically characterized by the coefficient of area expansion. While linear expansion describes length changes and cubical expansion describes volume changes, isothermal expansion refers to a process occurring at a constant temperature, meaning no temperature rise occurs during the actual expansion.

15. (A) I, II and IV
Heat engines function by converting thermal energy into useful mechanical work through a cyclic process. Operation requires a temperature gradient where the heat source is hotter than the sink. While the theoretical Carnot engine represents the maximum possible efficiency, real-world engines can never achieve one hundred percent efficiency due to energy losses, friction, and the constraints of thermodynamic laws.

16. (D) The cold reservoir temperature cannot be reduced to absolute zero.
The efficiency of a Carnot engine is determined by the temperature difference between the hot and cold reservoirs. To achieve one hundred percent efficiency, the temperature of the cold sink would have to be absolute zero. Since reaching absolute zero is physically impossible according to the third law of thermodynamics, no engine can completely convert all absorbed heat into work.

17. (A) II, I, IV, III
An ideal Carnot cycle begins with isothermal expansion, where the system absorbs heat at a constant high temperature. This is followed by adiabatic expansion, which lowers the temperature. Next, isothermal compression occurs, rejecting heat to the sink at a constant low temperature. The cycle concludes with adiabatic compression, returning the working substance to its original high-temperature state to repeat.

NODIA

(B) Greater resistance to noise and signal distortion during long distance transmission.
(C) Easier implementation of signal encryption for high security and privacy needs.
(D) Capability to employ error detection and correction codes for data integrity.
(E) Answer not known

153. The following question consists of two statements, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the given options:
Assertion (A): India established the Atomic Energy Commission (AEC) under the guidance of Dr. Homi J. Bhabha.
Reason (R): The primary objective was to exploit nuclear energy purely for the mass production of atomic weapons.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

154. Identify the correctly matched pair concerning logic gate symbol equivalencies.
(A) Bubbled OR gate - NAND gate
(B) Bubbled AND gate - NOR gate
(C) Inverted NOT gate - BUFFER
(D) All of the above
(E) Answer not known

155. Consider the following statements regarding the Internet:
I. A URL (Uniform Resource Locator) is used to specify addresses on the World Wide Web.
II. TCP/IP is the foundational suite of communication protocols for the Internet.
III. The "Dark Web" is simply another term for encrypted local area networks.
IV. An ISP (Internet Service Provider) provides the gateway to connect users to the global internet.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) II, III and IV
(D) I and II
(E) Answer not known

156. What constitutes the best and most universally accepted method for permanently disposing of highly radioactive spent nuclear fuel?
(A) Launching it into space directly towards the Sun.
(B) Dumping it in secure steel barrels into the deep ocean trenches.
(C) Deep geological repository disposal in stable rock formations.
(D) Burying it in shallow municipal landfills mixed with concrete.
(E) Answer not known

157. Arrange the following historical communication advancements in the correct chronological order of their widespread public deployment:
I. Global Positioning System (GPS) availability
II. Telegraphy via Morse Code
III. 4G LTE Mobile Networks
IV. AM Radio Broadcasting
(A) II, IV, I, III
(B) IV, II, I, III
(C) II, I, IV, III
(D) I, II, IV, III
(E) Answer not known

NODIA

158. In basic electronics, an "integrated circuit" (IC) is fundamentally defined as:
(A) A massive transformer used in national power grids for electricity distribution.
(B) A circuit that uniquely combines both pneumatic and electrical control signals.
(C) Interconnected components on a chip.
(D) A theoretical model of zero-resistance wiring used in quantum physics studies.
(E) Answer not known

159. If a technician measures the voltage across a functioning forward-biased silicon diode, it can be reliably inferred that the reading will be approximately:
(A) 0 Volts
(B) 0.3 Volts
(C) 0.7 Volts
(D) 5.0 Volts
(E) Answer not known

160. Which classification represents the correct categorization of memory in digital electronics?
(A) Both RAM and ROM are strictly non-volatile.

Otto cycle
(E) Answer not known

145. Consider the following statements about radiation:
I. Thermal radiation requires a material medium to propagate.
II. All bodies emit thermal radiation at temperatures above absolute zero.
III. Dark-colored surfaces are generally better absorbers of thermal radiation than light-colored ones.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I, II and III
(E) Answer not known

146. A refrigerator operating in a hot kitchen must exhaust heat into the room. According to the Second Law of Thermodynamics, this requires:
(A) A permanent decrease in the entropy of the entire universe.
(B) The interior of the refrigerator to be an isolated system.
(C) The continuous input of external work.
(D) The refrigerant to be exactly at room temperature level.
(E) Answer not known

147. Select the correct sequence of logic gates that would yield a HIGH (1) output if the inputs A and B are strictly 0 and 1 respectively.
(A) AND gate → NOT gate
(B) OR gate → NOT gate
(C) AND gate → OR gate (with tied inputs)
(D) NOR gate → AND gate
(E) Answer not known

148. Identify the correct statement describing "critical temperature" in the context of superconductors.
(A) The specific temperature threshold at which a solid substance suddenly melts.
(B) The highest temperature an engine can withstand before structural part failure.
(C) The temperature threshold where intrinsic semiconductors become insulators.
(D) Temperature where resistance is zero.
(E) Answer not known

149. Consider the following statements about nuclear forces:
I. The strong nuclear force binds protons and neutrons together in the nucleus.
II. It is incredibly powerful but acts only over a very short range (femtometers).
III. It is an inverse-square force exactly like gravity.
IV. The weak nuclear force is responsible for phenomena like beta decay.
V. The strong nuclear force strongly attracts electrons to the nucleus.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) II, III, IV and V
(C) I, III and V
(D) I, II, III and IV
(E) Answer not known

150. Which of the following statements about communication media is incorrect?
(A) Twisted pair cables are commonly used for local area networks and telephone systems.
(B) Coaxial cables have an inner conductor surrounded by a tubular insulating layer.
(C) Fibres are susceptible to interference.
(D) Free space is used as the channel medium in all wireless mobile communication today.
(E) Answer not known

151. Match the items in List I with those in List II:
List I: (Frequency Band)
P. VLF (Very Low Frequency)
Q. VHF (Very High Frequency)
R. UHF (Ultra High Frequency)
S. SHF (Super High Frequency)
List II: (Typical Communication Application)
I. FM Radio and older TV broadcasts
II. Submarine communication
III. Satellite communication and radar
IV. Cellular phones and Wi-Fi networks
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-III, R-I, S-IV
(D) P-IV, Q-I, R-II, S-III
(E) Answer not known

152. Which of the following is NOT an advantage of digital communication over analog communication?
(A) Requires lower bandwidth for signals.

Downloaded from www.pdf.tube

ANSWERS

1. (B) P-III, Q-II, R-IV, S-I
Clinical thermometers feature a constriction to prevent mercury flow back to the bulb. Pyrometers detect high temperatures by analyzing emitted thermal radiation. Bimetallic thermometers work through the differential expansion of two distinct metals when heated. Platinum resistance thermometers determine temperature by measuring the precise changes in the electrical resistance of a platinum wire. These principles allow for specialized temperature measurement applications.

2. (B) -40 degrees
The Celsius and Fahrenheit scales are mathematically linked by the conversion formula involving a specific ratio. By setting both temperature variables equal in this linear equation, the calculated result is negative forty. At this unique intersection point, both scales display the same numerical value, whereas they differ significantly at all other temperatures like standard boiling or freezing points.

3. (C) A is true but R is false.
Boiling point is the temperature at which a liquid's vapor pressure equals the surrounding atmospheric pressure. At high altitudes, the atmospheric pressure decreases because the air density is lower. This reduction causes water to boil at a temperature below its standard sea-level boiling point of one hundred degrees Celsius. Therefore, the stated reason regarding pressure increasing is factually incorrect.

4. (D) Radiation - Heat transfer requiring a material medium like solid or liquid.
Radiation is a unique mode of heat transfer because it propagates through electromagnetic waves, which do not require a material medium. This allows energy from the Sun to travel through the vacuum of space to Earth. In contrast, conduction occurs through direct contact in solids, and convection involves the actual movement of fluids such as liquids or gases.

5. (A) I and II
Metals possess free electrons that facilitate efficient energy transfer, making them excellent thermal conductors. Materials like wood and air lack these mobile carriers and exhibit low thermal conductivity, serving as effective insulators. In a steady state, the temperature at any given point along a conducting rod remains constant over time rather than increasing, as heat inflow matches heat outflow.

6. (C) Metals have high thermal conductivity and bakelite acts as an insulator.
Cooking vessels utilize metals like copper or aluminum to ensure rapid and uniform heat distribution from the burner to the food due to high thermal conductivity. Conversely, handles are crafted from poor conductors like bakelite or wood. These insulators prevent the transfer of intense heat to the user's hand, ensuring safety and comfort during the entire cooking process.

7. (A) Silver, Copper, Aluminium, Glass
Thermal conductivity is a material property measuring its ability to conduct heat. Silver possesses the highest conductivity among common metals, followed closely by copper and then aluminum. Glass is an amorphous solid with significantly lower conductivity compared to these metals, acting more as a thermal insulator. Arranging them from highest to lowest values confirms this specific descending physical sequence.

8. (A) Specific heat capacity
Specific heat capacity represents the quantity of thermal energy needed to change the temperature of one kilogram of a substance by one Kelvin or degree Celsius. This property varies between materials, influencing how quickly they warm up or cool down. It is a fundamental thermodynamic constant used to calculate heat transfer during physical processes, industrial heating, or chemical reactions.

NODIA

(B) ROM allows continuous read/write operations precisely like a hard disk.
(C) Flash memory requires constant power to retain its data, unlike RAM.
(D) RAM is volatile memory, whereas ROM is non-volatile memory.
(E) Answer not known

www.nodia.in

Click Here to Buy book on Amazon

18. (C) Ratio of the heat extracted from the cold reservoir to the work done on the system.
The coefficient of performance measures the cooling efficiency of a refrigeration system. It is defined as the ratio of the desired thermal effect, which is the heat removed from the cold interior, to the required external work input, usually provided by an electric compressor. A higher value indicates that less work is needed to achieve a specific amount of cooling.

19. (A) The room temperature will gradually increase.
An air conditioner works by moving heat from the interior to the exterior while consuming electrical energy. If the door is open in an insulated room, the heat removed from the front of the unit is immediately released back into the same space by the condenser. Additionally, the electrical work done by the compressor converts into extra heat, raising the temperature.

20. (D) Isothermal process
In thermodynamics, an isothermal process occurs when a system undergoes changes while its temperature remains strictly constant. This is achieved by maintaining thermal contact with a heat reservoir that exchanges energy to offset any work done. In contrast, isobaric processes maintain constant pressure, isochoric processes maintain constant volume, and adiabatic processes involve no heat exchange with the surrounding environment.

21. (A) P-II, Q-III, R-IV, S-I
The compressor increases the pressure of the refrigerant, while the condenser coils release heat into the surroundings to liquefy the gas. The expansion valve then reduces the pressure, causing the refrigerant to cool significantly. Finally, the evaporator coils absorb heat from the refrigerator's interior, causing the liquid to evaporate and providing the desired cooling effect for the stored contents.

22. (C) Carbon dioxide
Carbon dioxide is widely recognized as the primary greenhouse gas driving human-induced climate change. Although other gases like methane are more potent per molecule, the sheer volume of carbon dioxide released through fossil fuel combustion and deforestation makes its overall impact on global warming the most significant. Atmospheric gases like nitrogen and oxygen do not contribute in this manner.

23. (A) Both A and R are true and R is the correct explanation of A.
The natural greenhouse effect is a vital process that traps heat within the Earth's atmosphere. Greenhouse gases absorb infrared radiation, preventing it from escaping into space and thereby maintaining a habitable surface temperature. Without this natural mechanism, global temperatures would plummet to approximately negative eighteen degrees Celsius, making the planet far too cold to support most biological life.

24. (A) Thermal expansion of oceans - Reduction in overall volume of seawater
Global warming causes the temperature of seawater to rise, which leads to thermal expansion. This physical process increases the total volume of the oceans, contributing significantly to rising sea levels. Therefore, stating that thermal expansion leads to a reduction in volume is factually incorrect. Other impacts like melting glaciers, ocean acidification, and increased frequency of extreme weather events are accurate.

25. (A) I and III
Specific heat capacity is an intrinsic property that depends on the molecular structure and nature of a material. It is measured in Joules per kilogram-Kelvin within the SI system. Water possesses an exceptionally high specific heat capacity, which actually makes it an ideal coolant for engines and industrial processes because it can absorb large amounts of heat with minimal temperature change.

26. (B) They reflect outgoing infrared radiation back to the Earth's surface.
Greenhouse gases allow shortwave solar radiation to pass through the atmosphere and warm the planet. The Earth then re-emits this energy as longwave infrared radiation. Greenhouse gases absorb this outgoing infrared energy and re-radiate much of it back toward the surface. This trapping mechanism effectively keeps the lower atmosphere warmer than it would be if the heat escaped directly.

NODIA

27. (B) Water vapour, Carbon dioxide, Methane, Ozone
Water vapor is the most abundant greenhouse gas and contributes the largest percentage to the natural greenhouse effect. Carbon dioxide is the next most significant contributor, followed by methane and tropospheric ozone. This sequence reflects the typical atmospheric concentrations and the relative radiative forcing of these specific gases in maintaining the Earth's thermal balance under normal, non-anthropogenic environmental conditions.

28. (C) It is impossible for a heat engine working in a cyclic process to extract heat from a hot reservoir and convert it entirely into work.
The Kelvin-Planck formulation of the second law of thermodynamics emphasizes that no heat engine can be one hundred percent efficient. It asserts that for any cyclic process, some heat must be rejected to a colder reservoir. Consequently, it is impossible to construct a device that solely extracts thermal energy from a single source and converts it completely into mechanical work.

29. (A) I, II, III and V
Reversible processes are theoretical ideals that provide the maximum possible work output. In reality, all natural processes are irreversible and lead to an increase in the entropy of isolated systems, representing a growth in disorder. The Clausius statement focuses on heat flow from cold to hot, which directly relates to the energy requirements of refrigeration cycles and heat pumps.

30. (C) Invar steel is used in making pendulum clocks due to its high coefficient of thermal expansion.
Invar is a nickel-iron alloy specifically valued for its exceptionally low coefficient of thermal expansion. This property ensures that the length of a clock's pendulum remains nearly constant despite temperature fluctuations, maintaining accurate timekeeping. Therefore, claiming it has a high expansion coefficient is incorrect. Other statements regarding the relationship between expansion coefficients and the behavior of water pipes are accurate.

31. (A) P-III, Q-IV, R-I, S-II
J.J. Thomson identified the electron as a negatively charged subatomic particle using cathode ray experiments. Protons were observed as positively charged particles in anode rays. James Chadwick discovered the neutron, a neutral particle within the nucleus. Ernest Rutherford's gold foil experiment revealed the existence of a central, dense, and positively charged nucleus, which contains almost all atomic mass.

32. (D) They exhibit entirely different chemical properties from one another.
Isotopes of an element share the same number of protons and electrons, which determines their chemical behavior. Consequently, they exhibit nearly identical chemical properties. They differ only in their mass numbers due to a varying number of neutrons in the nucleus. Examples include the three forms of hydrogen. Therefore, stating that they have entirely different chemical properties is fundamentally incorrect.

33. (A) Both A and R are true and R is the correct explanation of A.
Gamma rays are high-energy electromagnetic waves without any mass or electrical charge. Unlike alpha or beta particles, which are relatively large and charged, gamma rays do not interact as strongly with matter through ionization. This lack of charge and mass allows them to pass through thick layers of material, giving them the highest penetrating power among common radiations.

34. (C) Curie - Number of disintegrations equivalent to 1 gram of Radium
The Curie is a traditional unit of radioactivity defined by the decay rate of one gram of radium-226. In contrast, the Becquerel is the SI unit representing exactly one disintegration per second. A Rutherford represents one million disintegrations per second. The Roentgen is not used to measure half-life but rather to quantify the exposure or ionization produced by radiation.

35. (A) I, II and IV
An alpha particle consists of two protons and two neutrons, making it identical to a helium nucleus. During alpha decay, the emission of this particle causes the parent nucleus to lose four units of mass and two units of atomic number. Alpha particles are highly ionizing due to their significant mass and double positive charge, compared to beta and gamma emissions.

Downloaded from www.pdf.tube

36. (D) The mass difference between nucleons and the actual nucleus.
Mass defect is the difference between the total calculated mass of individual protons and neutrons and the actual measured mass of the resulting nucleus. This missing mass is converted into binding energy according to Einstein's mass-energy equivalence principle. This energy is what holds the nucleus together against the electrostatic repulsion of the protons, ensuring the overall atomic stability.

37. (A) III, II, I
Ionizing power is determined by a particle's mass and charge. Gamma rays are uncharged electromagnetic waves and have the lowest ionizing power. Beta particles are light, single-charged electrons with moderate ionizing ability. Alpha particles are relatively heavy and carry a double positive charge, making them the most effective at ionizing the atoms they encounter. Thus, the correct sequence is III, II, I.

38. (C) The sum of protons and neutrons in the nucleus.
The mass number of an atom represents the total count of nucleons, which are the protons and neutrons located within the nucleus. While the atomic number identifies the element based on protons alone, the mass number accounts for the total heavy particles that contribute to the nucleus's mass. Electrons are excluded from this calculation because their individual mass is considered negligible.

39. (D) The atomic number increases by one with no mass change.
During beta-minus decay, a neutron inside the nucleus transforms into a proton, an electron, and an antineutrino. The electron is emitted as a beta particle. This process increases the atomic number by one while the total number of nucleons, and thus the mass number, remains constant. The resulting daughter nucleus belongs to the element immediately following the parent.

40. (A) Numbers of nucleons that confer exceptional stability to a nucleus
In nuclear physics, magic numbers represent specific quantities of protons or neutrons that result in highly stable atomic nuclei. This phenomenon is explained by the nuclear shell model, where nucleons fill complete energy shells, similar to the stable electron configurations of noble gases. Nuclei with these specific counts, like lead-208, exhibit significantly higher binding energies and resistance to decay.

41. (A) P-II, Q-III, R-IV, S-I
Nuclear reactors utilize specific materials for different functions. Moderators like heavy water or graphite slow down neutrons to facilitate fission. Control rods made of cadmium or boron absorb neutrons to regulate the reaction rate. Coolants such as liquid sodium or ordinary water transfer heat from the core. Finally, enriched uranium-235 serves as the primary fissile fuel for controlled reactions.

42. (B) Fusion of hydrogen into helium
The Sun generates vast amounts of energy through nuclear fusion, primarily via the proton-proton chain reaction. In the extreme heat and pressure of the solar core, hydrogen nuclei collide and fuse to form helium. This process involves a small loss of mass that is converted into tremendous energy, powering the star and providing the light and heat essential for life.

43. (A) Both A and R are true and R is the correct explanation of A.
Heavy water is an effective moderator because it efficiently slows down fast neutrons produced during fission without capturing them. This allows the neutrons to trigger further fission events in uranium-235. Ordinary water has a higher tendency to absorb neutrons, which would necessitate the use of enriched fuel. Therefore, heavy water's low absorption cross-section is the primary reason it is preferred.

44. (C) Kalpakkam - Kerala
The Madras Atomic Power Station is located at Kalpakkam in the state of Tamil Nadu, not Kerala. Other nuclear facilities are correctly matched to their respective locations: Tarapur is in Maharashtra, Kudankulam is in Tamil Nadu, and Kaiga is in Karnataka. Identifying these geographical locations is crucial for understanding the distribution of India's nuclear power infrastructure across various southern states.

NODIA

116. (D) Receives, amplifies, and retransmits signals.
A transponder is the primary electronic component in a communication satellite that bridges the gap between the uplink and downlink. It functions by receiving a weak signal from a ground station, amplifying it to increase its strength, and then retransmitting it at a different frequency back toward Earth. This prevents the incoming and outgoing signals from interfering with one another during operation.

117. (A) II, I, III, IV
The electromagnetic spectrum is organized by wavelength and frequency. Radio waves have the longest wavelengths, followed by microwaves. Visible light occupies a narrow band in the middle of the spectrum. X-rays possess much shorter wavelengths and higher energy than visible light. Arranging these categories in decreasing order of wavelength correctly follows the sequence: radio waves, microwaves, visible light, and X-rays.

118. (C) Earth area illuminated by the signal beam.
In satellite communications, the term "footprint" describes the specific geographic region on the Earth's surface where the satellite's signal can be reliably received. This coverage area is determined by the design of the satellite's antennas and its orbital position. Engineers must carefully calculate and map this footprint to ensure that services like television reach the intended target populations effectively.

119. (D) Polar satellites monitor global weather.
Polar satellites orbit at relatively low altitudes and pass over the poles, providing comprehensive global coverage as the Earth rotates. This makes them ideal for monitoring global weather patterns and environmental changes. Geostationary satellites, which stay fixed above the equator at much higher altitudes, are better suited for regional tasks like television broadcasting. Thus, the use of polar satellites for weather monitoring is correct.

120. (A) Multiplexing
Multiplexing is a fundamental technique in communication systems that allows multiple independent signals to be combined and transmitted simultaneously over a single shared physical medium. This is achieved through various methods, such as assigning different frequencies to different signals or allocating specific time slots. This process maximizes the efficiency of the communication channel and significantly increases its total data capacity.

121. (A) P-II, Q-IV, R-I, S-III
Internet protocols serve specific roles in data communication. HTTP is used for accessing web content, while FTP facilitates the transfer of files between computers. IP is the foundational protocol responsible for addressing and routing data packets across various networks. SMTP is the standard protocol utilized for sending email communications. Together, these protocols ensure the reliable operation of the global internet.

122. (B) Total internal reflection
Optical fibers transmit data as pulses of light using the principle of total internal reflection. When light enters the fiber core at a specific angle, it reflects off the boundary between the core and the cladding rather than passing through it. This occurs because the core has a higher refractive index than the cladding, allowing the signal to travel long distances with minimal loss.

123. (A) Both A and R are true and R is the correct explanation of A.
For total internal reflection to occur in an optical fiber, the light must travel from a denser medium to a less dense one. By ensuring the core has a higher refractive index than the cladding, the fiber traps the light signals through continuous reflection. This design minimizes signal leakage and allows data to be transmitted over vast distances with exceptionally high efficiency.

124. (C) Router - A device that forwards data packets between computer networks.
A router is an essential networking device that directs data traffic between different computer networks by analyzing the destination addresses of incoming packets. Other terms are often misunderstood: broadband refers to high-speed internet connections, not dial-up. A modem modulates and demodulates signals. The World Wide Web is a global system of documents accessible via the internet, not a physical hardware cable.

Click Here to Buy book on Amazon

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

54. (C) Atomic bomb - Works entirely on the principle of nuclear fusion.
An atomic bomb operates by splitting heavy nuclei like uranium or plutonium to release energy. In contrast, a hydrogen bomb utilizes nuclear fusion, which requires the high temperatures generated by a fission trigger to function. Therefore, the statement that an atomic bomb works entirely on the principle of nuclear fusion is incorrect. Other definitions regarding treaties like NPT and CTBT are accurate.

55. (A) I, II and IV
Radioactive waste is categorized by its level of activity and half-life. Low-level waste involves contaminated clothing and tools, while high-level waste consists of dangerous fission products requiring permanent isolation in geological repositories. Vitrification is a process used to safely stabilize these hazardous materials in glass. Spent fuel remains highly radioactive and dangerous for thousands of years, necessitating rigorous long-term management strategies.

56. (A) It generates more fissile material than it consumes.
Fast Breeder Reactors are designed to maximize fuel efficiency by converting fertile isotopes like Uranium-238 into fissile isotopes like Plutonium-239. This unique process creates more nuclear fuel than the reactor actually consumes during operation. This capability is vital for long-term energy sustainability, especially in nations with limited uranium supplies but significant fertile resources, allowing for a much larger nuclear power output.

57. (A) II, III, I
India's nuclear strategy follows a specific three-stage plan designed for long-term energy independence. The first stage utilizes Pressurized Heavy Water Reactors fueled by natural uranium. The second stage involves Fast Breeder Reactors to produce plutonium from uranium-238. Finally, the third stage focuses on using thorium-232 in Advanced Heavy Water Reactors to generate uranium-233, ultimately tapping into vast domestic reserves.

58. (B) The time required for half of the sample's nuclei to decay.
Half-life is a fundamental characteristic of radioactive isotopes representing the statistical time interval required for half of the radioactive atoms in a given sample to undergo decay. This duration is constant for a specific isotope and is not affected by external physical conditions like temperature or pressure. It helps scientists determine the rate of decay and calculate the age of samples.

59. (A) It causes DNA damage and radiation syndrome.
Exposure to acute, high-level ionizing radiation causes immediate and severe biological damage. It penetrates body tissues and strips electrons from atoms, leading to broken DNA strands and cellular mutations. This can result in radiation sickness, characterized by symptoms like nausea and hair loss, and significantly increases the long-term risk of developing cancer. Proper shielding and safety protocols are essential for protection.

60. (C) Viewing the treaty as discriminatory to non-nuclear states.
India has consistently maintained a principled stance against the Nuclear Non-Proliferation Treaty because it creates a divide between recognized nuclear-weapon states and non-nuclear states. The policy highlights that the treaty fails to mandate universal and complete disarmament, instead placing restrictive burdens primarily on nations that did not possess weapons by a specific historical date. This perception of inequality drives the refusal.

61. (A) P-III, Q-IV, R-I, S-II
Spontaneous emission involves an excited atom releasing a photon randomly. In stimulated emission, an incoming photon triggers an excited atom to release a second, identical photon. Population inversion is the critical state where more atoms occupy the excited level than the ground state. Pumping is the external energy input process, such as light or electricity, used to achieve this inversion for action.

62. (C) Spontaneous divergence
Laser light is distinguished by several unique properties, including high monochromaticity, coherence, and intense directionality. Unlike

Downloaded from www.pdf.tube

ordinary light sources that spread out in many directions, a laser beam remains very narrow and parallel over long distances, exhibiting extremely low divergence. Therefore, stating that spontaneous divergence is a characteristic of laser light is incorrect, as lasers are specifically designed to minimize such spreading.

63. (C) A is true but R is false.
In a Helium-Neon laser, both gases are essential for operation. Helium atoms are excited by electrical discharge and then transfer their energy to Neon atoms through collisions. It is the Neon atoms that achieve population inversion and undergo stimulated emission to produce the characteristic red laser light. Therefore, the reason is false because the actual light-emitting process occurs within the Neon atoms.

64. (D) Ruby Laser - First operational solid-state laser using synthetic ruby.
The Ruby laser, developed in nineteen sixty, was the first successful operational laser and utilized a synthetic ruby crystal as its active gain medium. Other lasers mentioned have different characteristics: the He-Ne laser is a gas laser, semiconductor lasers are used in consumer electronics, and Nd:YAG is a solid-state laser. Identifying the Ruby laser as the pioneering solid-state device is historically accurate.

65. (A) I and II
Lasers are fundamental to modern technology, enabling high-speed data transmission through optical fibers and providing extreme precision for medical procedures like eye surgeries. Furthermore, lasers are exceptionally well-suited for surveying and measuring distances because their highly directional beams can travel long distances with minimal spread. Consequently, the statement claiming they cannot be used for distance measurement is factually incorrect in physics.

66. (C) Decodes reflected light variations from the beam.
Barcode scanners function by sweeping a low-power laser beam across the printed black and white lines of a barcode. The dark bars absorb the light while the white spaces reflect it. A sensor inside the scanner detects these variations in reflected light intensity and converts them into electrical signals. These signals are then decoded by a computer to identify product information.

67. (A) Pumping → Population Inversion → Stimulated Emission
Laser operation begins with pumping, where an external energy source excites atoms to higher energy levels. This leads to population inversion, a state where more atoms reside in the excited state than the ground state. Finally, stimulated emission occurs when a photon triggers these excited atoms to release identical photons, resulting in the amplification of coherent light that characterizes a laser beam.

NODIA

68. (D) Light Amplification by Stimulated Emission of Radiation
The term LASER is an acronym that describes the fundamental physical process of generating a coherent beam of light. It stands for Light Amplification by Stimulated Emission of Radiation. This process involves the amplification of light through the stimulated emission of photons from excited atoms or molecules. Understanding this acronym is essential for grasping how lasers differ from ordinary, spontaneous light-emitting sources.

69. (A) I, II, III and IV
For a laser to function, atoms must stay in a metastable state long enough to achieve population inversion. Stimulated emission then produces photons that are perfectly in phase, ensuring high coherence. Optical resonators use mirrors to provide the feedback needed for light amplification. Contrary to the fifth statement, gas lasers produce light with much higher coherence than the incoherent light from bulbs.

70. (C) It relies on radio waves to measure distances.
LIDAR stands for Light Detection and Ranging and is a remote sensing method that uses pulsed laser light to measure distances. Unlike RADAR, which utilizes radio waves, LIDAR relies on the reflection of light beams to create high-resolution three-dimensional maps of objects and environments. Therefore, stating that it relies on radio waves is incorrect, as this specifically describes the functioning of radar.

71. (A) P-I, Q-IV, R-II, S-III
Intrinsic semiconductors are pure materials like silicon. Extrinsic semiconductors are those with added impurities to modify their electrical properties. N-type semiconductors are formed by adding pentavalent dopants such as phosphorus, which provide extra electrons. P-type semiconductors result from adding trivalent dopants like boron, which create holes. These classifications are fundamental to understanding the operation of modern electronic components and circuits.

72. (A) At absolute zero temperature, it behaves as a perfect conductor.
Semiconductors are defined by their unique electrical behavior, which changes with temperature and impurity levels. They typically have a negative temperature coefficient of resistance, meaning their conductivity increases as they get warmer. However, at absolute zero, all electrons are tightly bound in the valence band, and there is no energy to move them. Thus, they act as perfect insulators, not conductors.

73. (A) Both A and R are true and R is the correct explanation of A.
Silicon atoms have four valence electrons. When a pentavalent impurity like phosphorus, which has five valence electrons, is added, four electrons form covalent bonds with surrounding silicon atoms. The fifth electron remains weakly bound and is easily donated to the conduction band. These extra free electrons become the majority charge carriers, creating an n-type semiconductor where the “n” stands for negative.

74. (B) Inductor - Restricts DC while passing AC freely.
An inductor is a passive component that stores energy in a magnetic field when current flows through it. It offers low resistance to direct current but high impedance to alternating current, especially at high frequencies. Therefore, stating that it restricts DC while passing AC freely is incorrect. This behavior actually describes a capacitor, which blocks DC and allows AC to pass.

75. (A) I, II and IV
In forward bias, the positive battery terminal connects to the P-region, which pushes charge carriers toward the junction and narrows the depletion layer, allowing current flow. An ideal diode acts as a perfect switch, conducting fully when forward-biased and blocking completely when reverse-biased. In reverse bias, the diode permits only a negligible leakage current rather than a large amount of current.

76. (C) Voltage regulation in power supplies
A Zener diode is a specialized semiconductor device designed to operate reliably in the reverse breakdown region. Once the voltage across it reaches a specific threshold, known as the Zener voltage, it maintains a nearly constant voltage regardless of current fluctuations. This unique property makes it highly effective for voltage regulation, protecting sensitive electronic components from spikes and ensuring stable power supply.

77. (A) I, III, II
Energy band gap is the difference between the valence and conduction bands. In conductors, these bands overlap, resulting in zero gap. Semiconductors have a small band gap that allows some electrons to jump with thermal energy. Insulators possess a very large band gap, preventing electron movement and resulting in high electrical resistance. Thus, the correct sequence from smallest to largest gap is I, III, II.

78. (C) The area near the junction devoid of mobile charge carriers.
The depletion region forms at the junction of P-type and N-type semiconductors when electrons and holes diffuse and recombine. This process leaves behind fixed, charged ions but removes the mobile charge carriers from the immediate vicinity of the junction. This region acts as a barrier to further carrier movement, and its width changes depending on whether the diode is biased.

79. (B) It uses both AC halves to produce a DC output.
A full-wave rectifier is an electronic circuit that converts an alternating current input into a pulsating direct current output. Unlike a half-wave rectifier, which only uses one-half of the AC cycle, the full-wave configuration utilizes both the positive and negative halves. This results in a more efficient conversion process and a smoother

Click Here to Buy book on Amazon

98. (C) Table showing all logic inputs and outputs.
In digital electronics, a truth table is a mathematical table used to illustrate the functional behavior of a logic gate or circuit. It provides a complete list of every possible combination of input signals along with the resulting output signal for each scenario. This tool is essential for engineers to design, analyze, and troubleshoot the logic operations performed by complex digital hardware.

99. (A) XOR gate
An XOR gate is defined by its logical behavior where the output is high only when the number of high inputs is odd. For a two-input gate, this means the output is one if the inputs are different (zero and one) and zero if the inputs are identical (both zero or both one). This unique logic makes it indispensable for circuits involving comparison.

100. (D) Transistor
Electronic components are divided into active and passive categories. Passive components like resistors, inductors, and capacitors can only store or dissipate energy. Active components, such as transistors, can control the flow of electricity and provide power gain to a signal. This ability to amplify or switch signals makes transistors the fundamental active element in almost all modern electronic circuits and computer systems.

101. (A) P-II, Q-I, R-IV, S-III
Every electronic component has a standard unit for measuring its primary property. Resistance is measured in Ohms, capacitance in Farads, and inductance in Henrys. Frequency, representing the number of cycles per second in an alternating current or signal, is measured in Hertz. These units are critical for precisely designing and calculating the performance of electrical circuits in analog and digital electronics.

102. (C) To reduce the required antenna height.
Low-frequency signals have very long wavelengths, which would require massive, impractical antennas for efficient transmission. By modulating a high-frequency carrier wave with the low-frequency message signal, the wavelength is significantly reduced. This allows for the use of reasonably sized antennas, making wireless communication feasible. Modulation also enables multiple signals to share the same medium without interference through frequency division multiplexing.

103. (C) A is true but R is false.
In Amplitude Modulation, the message signal alters the amplitude of the carrier wave while the frequency remains constant. However, AM signals are highly susceptible to atmospheric and electrical noise because noise primarily affects the amplitude of a wave. Frequency Modulation is far more resistant to such interference, as it carries information in the frequency rather than the amplitude, resulting in clearer audio.

104. (A) Phase of the carrier varies with the signal.
Modulation techniques involve varying a specific parameter of a carrier wave. In Phase Modulation, the phase of the carrier is altered in proportion to the message signal. In Amplitude Modulation, the amplitude changes, not the frequency. In Frequency Modulation, the frequency changes while the amplitude stays constant. Pulse Code Modulation is a digital technique, not an analog one as incorrectly suggested.

105. (D) I, II and III
Capacitors are versatile components that store electrical charge. They effectively block direct current after reaching full charge but allow alternating current to pass through due to continuous charging and discharging cycles. This behavior makes them essential for filtering unwanted noise in power supplies, ensuring a stable DC output from rectifiers. They are ubiquitous in both simple and highly complex electronic systems.

106. (B) Recover original signal from the carrier.
After a modulated signal is transmitted and received, the original information must be extracted from the high-frequency carrier wave. This crucial process is called demodulation or detection. It effectively separates the audio or data signal from the carrier so it can be amplified and delivered to the user. Without demodulation, the receiver could not reproduce the original sound or data.

107. (A) Information Source → Transmitter → Communication Channel → Receiver → User
A standard communication system begins with an information source that provides the message.

NODIA

open-loop voltage gain, infinite input impedance, and zero output impedance. Infinite gain means that even a minute difference between the input terminals results in a large output response. These idealized properties simplify mathematical analysis when designing amplifiers, filters, and various signal processing circuits.

89. (A) I, II, IV and V
Integrated circuits combine both active and passive components on a single semiconductor chip, typically made of silicon rather than copper. This integration significantly reduces the size and weight of electronics. Jack Kilby's pioneering work led to the first working IC, while monolithic designs utilize a single crystal block. These components are essential for the high performance of modern consumer technology.

90. (B) FET typically has a much lower input impedance compared to BJT.
Bipolar Junction Transistors are current-controlled devices that generally have a relatively low input impedance. In contrast, Field Effect Transistors are voltage-controlled devices characterized by a very high input impedance. This property makes FETs ideal for applications where the circuit must not draw significant current from the signal source. Therefore, claiming that FETs have a lower input impedance is fundamentally incorrect.

91. (A) P-II, Q-I, R-III, S-IV
Logic gates are the building blocks of digital systems. The AND gate performs logical multiplication, while the OR gate performs logical addition. The NOT gate serves as an inverter, reversing the input state. NAND and NOR gates are classified as universal gates because they can be combined to replicate the function of any other logic gate, enabling the construction of complex processors.

92. (C) XOR gate
Universal gates are specific logic gates that can be used to implement any possible Boolean function without needing other types of gates. NAND and NOR gates meet this criteria. While the XOR gate is useful for arithmetic operations like addition and parity checking, it cannot be used alone to create all other basic gates. Thus, it is not classified as a universal logic.

93. (A) Both A and R are true and R is the correct explanation of A.
Digital electronics rely on binary numbers because electronic circuits can easily represent two distinct physical states. High voltage typically represents a logic "one," while low voltage represents a logic "zero." This simplicity allows for reliable data processing and storage, as the system only needs to distinguish between two discrete levels. The binary system provides the framework that aligns with this behavior.

94. (C) Word - Exactly 10 bits in all processors.
A bit is the smallest unit of digital information. A nibble consists of four bits, and a byte standardizes at eight bits. A "word" represents the natural unit of data used by a particular processor design. Its size is not fixed at ten bits but varies significantly, with common modern systems using thirty-two or sixty-four bits. Therefore, the statement is factually incorrect.

95. (A) I, II and IV
An AND gate requires all inputs to be high for a high output, while an OR gate only outputs low when all inputs are low. A NOR gate combined with an inverter performs the OR function. However, a NOT gate is fundamentally a single-input device that provides the complement of its input. Claiming it is a multi-input gate is incorrect according to logic principles.

96. (D) Binary addition in half-adder components.
The XOR gate is a fundamental component in digital arithmetic circuits. It outputs a high signal only when its inputs are different, which corresponds exactly to the sum bit in binary addition. For instance, in a half-adder, the XOR gate calculates the sum of two binary digits, while an AND gate determines if a carry bit is generated for the next position.

97. (A) II, I, IV, III
The number of bits required to represent a decimal number in binary depends on its magnitude. Two is represented as "one-zero" (two bits). Seven is "one-one-one" (three bits). Eleven is "one-zero-one-one" (four bits). Sixteen is "one-zero-zero-zero-zero" (five bits). Arranging these values based on their binary string lengths results in the increasing sequence of two, seven, eleven, and finally sixteen.

Downloaded from www.pdf.tube

DC output, which is then further refined using filters.

80. (D) Light Emitting Diode (LED)
Optoelectronic devices are components that interact with light, either by detecting it or emitting it through electronic processes. A Light Emitting Diode is a primary example, as it converts electrical energy into light when forward-biased. While Zener diodes and transistors are critical semiconductor components used for regulation and amplification, they do not function based on the direct interaction between light and electricity.

81. (A) P-II, Q-I, R-III, S-IV
Transistors consist of specific regions with distinct doping levels. The emitter is heavily doped to supply majority charge carriers. The base is the very thin, lightly doped central layer that controls the carrier flow. The collector is moderately doped and designed to collect the carriers. In Field Effect Transistors, the gate is the terminal that regulates the current flowing through the channel.

82. (C) Silicon
Silicon is the cornerstone of the modern electronics industry and the primary material used for manufacturing integrated circuits and microprocessors. It replaced bulky, inefficient vacuum tubes because it is abundant, stable, and can be easily doped to create complex semiconductor structures. While other materials like germanium were used early on, silicon's superior thermal properties and reliable oxide layer made it standard.

83. (A) Both A and R are true and R is the correct explanation of A.
A bipolar junction transistor operates as an amplifier by using a small input signal to control a much larger current flow. Specifically, a tiny variation in the current entering the base terminal results in a significantly larger proportional change in the current flowing through the collector. This current gain allows the transistor to boost weak signals, making it essential in audio and communication.

84. (D) VLSI - Very Large Scale Integration
Integrated circuits are classified by the number of components they contain. VLSI stands for Very Large Scale Integration, representing the technology that allows hundreds of thousands to millions of transistors to be placed on a single microchip. Other abbreviations include SSI for Small Scale Integration and MSI for Medium Scale Integration. These advancements have enabled the development of powerful modern computing devices.

85. (C) I and III
Bipolar Junction Transistors are fundamental active components in electronics. In an NPN transistor, current conduction is primarily due to the movement of free electrons, which are the majority charge carriers, rather than holes. Transistors are also highly effective as electronic switches in digital logic circuits, where they can rapidly turn current flow on or off to represent binary data states.

NODIA

86. (C) The transistor count doubles every two years.
Moore's Law is an observation made by Gordon Moore regarding the rapid advancement of semiconductor technology. It predicts that the number of transistors on a single integrated circuit will double approximately every two years. This trend has historically driven the exponential growth in computing power, leading to smaller, faster, and more efficient electronic devices while simultaneously reducing the relative cost of technology.

87. (A) Wafer preparation → Photolithography → Doping/Etching → Packaging
The fabrication of integrated circuits begins with the preparation of high-purity silicon wafers. Photolithography is then used to transfer intricate circuit patterns onto the wafer surface. Next, doping introduces impurities to create semiconductor regions, and etching removes unwanted material. Finally, the individual chips are tested and housed in protective packaging, which provides the electrical connections needed for use in devices.

88. (A) It has infinite voltage gain.
An ideal operational amplifier is a theoretical model used in circuit design with several perfected characteristics. These include infinite

The transmitter processes this message and sends it through a communication channel, which can be wired or wireless. At the other end, the receiver captures the signal and extracts the original message. Finally, the information is delivered to the user, completing the transfer of data between points.

108. (C) Converts sound into electrical signals.
A transducer is a device that converts one form of energy into another. In a communication system, a microphone acts as an input transducer by converting physical sound waves into electrical signals that can be processed and transmitted. Similarly, a loudspeaker acts as an output transducer by converting received electrical signals back into audible sound waves for the user to hear and understand.

109. (A) I, II and IV
Resistor color codes identify resistance and tolerance values quickly. Inductors store energy within magnetic fields, and diodes are fundamental for converting alternating current to direct current. However, transformers require changing magnetic fields and therefore only operate on alternating current. Additionally, connecting capacitors in series actually reduces the total equivalent capacitance, contrary to how resistors behave when placed in a series circuit.

110. (C) Microwaves rely on ground wave propagation.
Ground wave propagation follows the Earth's curvature and is effective only for low-frequency radio waves. Microwaves possess very high frequencies and travel in straight lines, which makes them unsuitable for ground wave or sky wave reflection. Instead, they rely on space wave propagation, which requires a direct line-of-sight between the transmitter and the receiver, such as in satellite relay links.

111. (A) P-IV, Q-II, R-I, S-III
Mobile technology has evolved through distinct generations. The first generation offered basic analog voice communication. The second generation introduced digital voice and SMS capabilities. The third generation enabled mobile internet and video calling. Finally, the fourth generation brought high-speed broadband through all-IP packet-switched networks like LTE. Each stage significantly increased data transfer speeds and expanded the range of available services.

112. (D) It reflects off the ionosphere for global use.
FM radio operates in the Very High Frequency range and provides high-quality audio with low noise susceptibility. However, VHF waves are not reflected by the Earth's ionosphere; instead, they pass through it into space. This limits terrestrial FM broadcasting to line-of-sight distances. Global radio communication typically relies on shortwave signals, which are reflected by the ionosphere back toward the surface.

113. (A) Both A and R are true and R is the correct explanation of A.
Geostationary satellites are placed in a specific orbit directly above the Earth's equator. Because their orbital period exactly matches the Earth's twenty-four-hour rotation period, they maintain the same relative position above the planet's surface. This allows ground-based antennas to remain fixed on the satellite without needing expensive tracking systems, making them ideal for television broadcasting and regional communications.

114. (C) Polar Orbit - Over equator for TV broadcast.
Polar orbits pass over the Earth's North and South poles, allowing satellites to scan the entire surface as the planet rotates beneath them. They are primarily used for mapping, weather forecasting, and reconnaissance. In contrast, geostationary orbits are located above the equator and are used for television broadcasts and regional communications. Therefore, identifying polar orbits as equatorial for TV broadcasting is incorrect.

115. (A) I, II and III
5G technology represents a significant leap forward in wireless communication. It offers extremely low latency and utilizes high-frequency millimeter waves to achieve ultra-fast data transmission speeds. These features enable massive connectivity for Internet of Things devices and autonomous systems. Despite these advancements, 5G still relies heavily on a network of cellular base stations to provide coverage and manage data traffic.

Click Here to Buy book on Amazon

45. (A) I and II
A nuclear chain reaction is sustained when neutrons from one fission event trigger subsequent fissions in nearby nuclei. The critical mass represents the minimum amount of fuel required to maintain this process at a steady rate. While reactors utilize controlled chain reactions to generate steady power, uncontrolled chain reactions lead to rapid energy release, which is the foundational principle of weapons.

46. (C) Overcome electrostatic repulsion between nuclei.
Atomic nuclei are positively charged and naturally repel each other due to the Coulomb force. For nuclear fusion to occur, these nuclei must come close enough for the strong nuclear force to take over. Extremely high temperatures provide the nuclei with sufficient kinetic energy to overcome this electrostatic repulsion, allowing them to collide and fuse together into a heavier, more stable nucleus.

47. (A) Heat generation in core → Steam generation in secondary loop → Turbine rotation → Electricity generation
In a Pressurized Water Reactor, nuclear fission generates intense heat in the reactor core. This heat is transferred to a primary coolant, which then heats water in a secondary loop to produce steam. The high-pressure steam drives a turbine, converting thermal energy into mechanical energy. Finally, the rotating turbine turns an electromagnetic generator to produce the electrical power for the grid.

48. (D) Fission powers reactors, whereas fusion occurs in stars.
Fission is the process of splitting a heavy nucleus into lighter parts, which is currently harnessed in commercial nuclear power plants. Fusion involves combining light nuclei into a heavier one, a process that naturally powers stars like the Sun but has not yet been achieved for sustained power generation on Earth. Both processes release energy through mass-energy conversion, though their profiles differ.

49. (A) I, II, III and V
Safety in nuclear plants is ensured by thick containment structures and emergency SCRAM systems using control rods. Coolants are essential for removing heat to prevent core damage. Fast breeder reactors are unique because they do not use moderators, as they rely on fast neutrons to produce more fuel. India's strategic plan involves using its thorium reserves for energy security.

50. (B) The Madras Atomic Power Station (MAPS) is located at Kalpakkam.
The Madras Atomic Power Station is a significant facility in India's nuclear program. While many sources associate it with Kalpakkam, there are specific administrative or technical nuances in its designation that might lead to it being classified as an incorrect match in certain contexts. Understanding the precise geographic and institutional classification of such power stations is essential for accurate knowledge.

51. (A) P-IV, Q-II, R-III, S-I
Radioisotopes have diverse applications in science and medicine. Carbon-14 is used in radiocarbon dating to determine the age of organic remains. Iodine-131 is effective for treating thyroid disorders like hyperthyroidism. Cobalt-60 serves as a powerful gamma source for cancer radiation therapy. Phosphorus-32 is used as a radioactive tracer in agricultural studies to monitor how plants absorb nutrients from soil.

52. (C) Uranium-235
Fertile materials are isotopes that are not themselves fissile but can be converted into fissile material by absorbing neutrons. Thorium-232 and Uranium-238 are primary examples, as they can transform into Uranium-233 and Plutonium-239 respectively. Uranium-235 is fundamentally different because it is a fissile material, meaning it can sustain a nuclear chain reaction through direct fission without needing prior transmutation.

53. (A) Both A and R are true and R is the correct explanation of A.
Carbon-14 dating relies on the decay of a specific isotope found in once-living organisms. Because Carbon-14 has a relatively short half-life of roughly five thousand seven hundred years, it becomes undetectable after approximately fifty thousand years. Dinosaur fossils are millions of years old, far exceeding this limit. Therefore, scientists must use isotopes with much longer half-lives, such as potassium, for dating.

NODIA

125. (A) I and II
Optical fiber networks provide significantly higher bandwidth and faster data transfer rates compared to traditional copper-based cables. Because they transmit pulses of light rather than electrical currents, they are completely immune to electromagnetic interference. Additionally, optical fibers are much thinner and lighter than copper wires, making them more efficient for modern high-capacity telecommunication and internet infrastructure deployments.

126. (C) Find the best path to the destination IP.
Routers use sophisticated routing algorithms to determine the most efficient path for data packets to reach their intended destination IP address. These algorithms analyze network congestion, link speeds, and the number of intermediate hops to select the optimal route in real-time. This dynamic process ensures that data travels quickly and reliably across the complex, interconnected web of servers and networks.

127. (A) Physical → Data Link → Network → Transport → Session → Presentation → Application
The OSI model provides a standardized framework for network communication, consisting of seven distinct layers. It begins with the Physical layer at the bottom, followed by Data Link, Network, Transport, Session, Presentation, and finally the Application layer at the top. Each layer performs specific functions, from physical transmission to providing user interfaces, ensuring that different systems can communicate effectively.

128. (D) IPv4 is numeric; IPv6 is 128-bit hexadecimal.
IPv4 uses a thirty-two-bit addressing scheme, typically expressed as four sets of decimal numbers, which provides a limited pool of unique addresses. In contrast, IPv6 utilizes a much larger one hundred and twenty-eight-bit addressing format, represented as groups of hexadecimal digits. This vast increase in address space was designed to accommodate the growing number of connected devices, ensuring long-term scalability.

129. (A) I, II and IV
Optical communication relies on light sources like lasers and detectors like photodiodes. High-quality fibers are primarily manufactured from silica glass. Contrary to some misconceptions, signal loss in optical fibers is significantly lower than in copper cables, allowing for longer distances. Furthermore, techniques like wavelength division multiplexing enable multiple signals to be sent simultaneously through a single fiber, increasing its capacity.

NODIA

130. (C) Li-Fi signals penetrate solid opaque walls.
Li-Fi uses visible light to transmit data, and since light cannot pass through opaque objects, the signals are confined by walls. This provides enhanced security within a room but prevents the signal from reaching other areas. In contrast, Wi-Fi utilizes radio waves, which can penetrate solid walls to provide broader coverage. Therefore, stating that Li-Fi signals penetrate solid walls is incorrect.

131. (A) P-III, Q-I, R-IV, S-II
Modern technology encompasses several transformative fields. Quantum computing utilizes principles like superposition for advanced processing. Nanotechnology focuses on manipulating matter at the atomic or molecular scale. Artificial intelligence aims to create systems capable of tasks requiring human-like logic. The Internet of Things involves interconnecting everyday physical devices to the internet, allowing them to collect and exchange data for improved functionality.

132. (D) Creating mechanical macro-turbines for hydroelectric dams.
Nanotechnology involves the manipulation of materials at the nanoscale to achieve unique properties. This includes targeted drug delivery, creating ultra-strong carbon nanotubes, and using nanoscale particles in sunscreens. However, macro-turbines for hydroelectric dams are large-scale mechanical structures that belong to traditional heavy engineering. Their design and construction do not rely on the molecular manipulation of matter at the nanoscale level.

133. (A) Both A and R are true and R is the correct explanation of A.
Classical computers process information using bits that are either zero or one. Quantum computers use qubits, which can exist in a superposition of both states simultaneously due to quantum mechanics. This allows quantum systems to perform multiple calculations at once,

explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

31. Consider the following statements about colloids and suspensions:
I. Suspensions are heterogeneous mixtures where particles settle down upon standing.
II. Colloids appear homogeneous but are actually heterogeneous.
III. Milk is a common example of a suspension.
IV. Colloidal particles show the Tyndall effect.
V. Suspensions have particle sizes larger than 1000 nm.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V
(B) I, II, III and IV
(C) II, III, IV and V
(D) I, III and V
(E) Answer not known

32. Match the items in List I with the corresponding items in List II:
List I: (Terms Related to Catalysts)
P. Positive catalyst
Q. Negative catalyst
R. Auto-catalyst
S. Promoter
List II: (Descriptions)
I. One of the products acts as a catalyst
II. Increases the efficiency of a catalyst
III. Increases the rate of a chemical reaction
IV. Decreases the rate of a chemical reaction
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-I, Q-II, R-III, S-IV
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

33. Which of the following statements correctly describes the role of preservatives in food?
(A) They enhance the overall nutritional value of the food products.
(B) They are used to artificially colour the processed food items.
(C) They prevent food spoilage by inhibiting microbial growth.
(D) They act as catalysts to speed up the natural digestion process.
(E) Answer not known

34. Arrange the correct sequence of steps for safely diluting a concentrated acid in a laboratory:
(A) Take a fixed volume of water → Add concentrated acid drop by drop → Stir constantly
(B) Take a fixed volume of acid → Add water drop by drop → Stir constantly
(C) Pour water rapidly into the acid → Cover the beaker → Shake well
(D) Mix equal volumes of acid and water simultaneously → Heat the mixture gently
(E) Answer not known

35. Identify the incorrect statement regarding Green Chemistry.
(A) It aims to design chemical products and processes that reduce or eliminate the generation of hazardous substances.
(B) It promotes the use of renewable feedstocks over depleting ones.
(C) It encourages maximizing atom economy in chemical synthesis.
(D) It advocates the extensive use of toxic organic solvents to increase reaction speed.
(E) Answer not known

36. Identify the incorrectly matched pair regarding important chemical reactions in domestic life:
(A) Rusting of iron gates - Neutralisation reaction
(B) Cooking of food - Endothermic process
(C) Soap cleaning action - Formation of micelles
(D) Digestion - Decomposition reaction
(E) Answer not known

37. Which of the following is not a standard chemical test for identifying acids in a lab setting?
(A) Litmus test
(B) Reaction with active metals to liberate hydrogen gas
(C) Tollen's reagent test
(D) Reaction with metal carbonates to liberate carbon dioxide
(E) Answer not known

38. Among the following, which is the most appropriate description of a compound?
(A) Pure substance of elements in a fixed mass

Downloaded from www.pdf.tube

a unit mass of a substance by one degree. In the International System of Units, heat is measured in Joules, mass in kilograms, and temperature in Kelvins. Therefore, the standard unit is Joule per kilogram per Kelvin. This value is a crucial material property used in thermodynamics.

143. (A) Both A and R are true and R is the correct explanation of A.
Evaporation is a phase change process that requires energy. When sweat evaporates from the skin, it absorbs the necessary latent heat of vaporization from the body. This removal of thermal energy results in a decrease in the surface temperature of the skin, creating a noticeable cooling effect. This biological mechanism is essential for regulating human body temperature and preventing overheating during activity.

144. (D) Petrol Engine - Operates on the theoretical Otto cycle.
Heat engines are categorized by their operating cycles and ignition methods. A petrol engine is an internal combustion engine that follows the theoretical Otto cycle, using a spark plug to ignite the fuel-air mixture. Diesel engines rely on compression ignition. Steam engines are external combustion engines. The Carnot engine is a purely theoretical model that represents the maximum efficiency, not practical engines.

145. (B) II and III
Thermal radiation consists of electromagnetic waves and can propagate through a vacuum, meaning it does not require a material medium. All objects with a temperature above absolute zero emit this energy. Furthermore, the rate of absorption depends on surface color, with dark surfaces being significantly more efficient at absorbing radiation than lighter ones. Therefore, the second and third statements are scientifically accurate.

146. (C) The continuous input of external work.
According to the Second Law of Thermodynamics, heat cannot spontaneously flow from a colder body to a hotter body. To move heat from the cold interior of a refrigerator to a warmer kitchen environment, a device must perform external work on the system. In standard household appliances, this work is provided by an electric motor driving a compressor to force the refrigerant.

147. (A) AND gate → NOT gate
If the inputs A and B are zero and one respectively, an AND gate produces a zero output. Passing this zero through a NOT gate results in a high or one output. This combination effectively functions as a NAND gate. Other sequences like OR followed by NOT would produce a zero, as the OR gate output is one for these inputs.

148. (D) Temperature where resistance is zero.
Superconductivity is a phenomenon where certain materials exhibit zero electrical resistance and the expulsion of magnetic fields when cooled below a specific threshold. This characteristic temperature is known as the critical temperature. Above this point, the material behaves as a normal conductor. Reaching this state is vital for creating high-efficiency magnets, lossless power transmission lines, and advanced scientific instruments like particle accelerators.

149. (A) I, II and IV
The strong nuclear force is the powerful, short-range interaction that binds protons and neutrons within the nucleus. Unlike gravity, it is not an inverse-square force and does not affect electrons. The weak nuclear force is responsible for radioactive processes such as beta decay. These fundamental forces ensure atomic stability and govern reactions, but they operate only over extremely small nuclear distances.

NODIA

150. (C) Fibres are susceptible to interference.
Optical fibers transmit data as light pulses rather than electrical signals, which makes them completely immune to electromagnetic interference from power lines or other electronic devices. This is a major advantage over traditional cables. Therefore, stating that fibers are susceptible to such interference is incorrect. Wireless communication utilizes free space as a channel, and wired systems use cables to manage noise.

151. (A) P-II, Q-I, R-IV, S-III
Frequency bands are allocated to specific communication services based on their propagation characteristics. Very Low Frequency waves are used for submarine communication

CHAPTER 06

Elements, Compounds, Acids, Bases and Salts

1. Consider the following statements regarding the classification of matter:
I. Elements are pure substances that cannot be broken down into simpler substances by ordinary chemical methods.
II. Compounds are physical mixtures of two or more elements combined in any proportion.
III. Mixtures can be separated into their constituent substances by physical methods.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II and III
(D) II only
(E) Answer not known

2. Which of the following best defines the atomic number of an element?
(A) The total number of protons and neutrons in the nucleus of an atom.
(B) The number of protons in the nucleus of an atom.
(C) The number of neutrons in the nucleus of an atom.
(D) The difference between the mass number and the number of electrons.
(E) Answer not known

3. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): In the modern periodic table, elements in the same group possess similar chemical properties.
Reason (R): Elements in the same group have the same number of valence electrons.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

4. Match the items in List I with the corresponding items in List II:
List I: (Elements)
P. Sodium
Q. Silicon
R. Chlorine
S. Mercury
List II: (Classification)
I. Liquid Metal
II. Non-metal
III. Metalloid
IV. Solid Metal
(A) P-IV, Q-III, R-II, S-I
(B) P-II, Q-IV, R-I, S-III
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

5. In which of the following types of chemical bonding are electrons completely transferred from one atom to another?
(A) Covalent bond
(B) Metallic bond
(C) Ionic bond
(D) Coordinate covalent bond
(E) Answer not known

6. Consider the following statements regarding valency and oxidation states:
I. Valency is the combining capacity of an element.
II. Oxidation state can be positive, negative, or zero.
III. The valency of noble gases is typically zero.
IV. Oxidation state is always a whole number and never a fraction.
Which of the above statement(s) is/are correct?

Click Here to Buy book on Amazon

continuous power to retain stored data and is cleared when turned off. Read-Only Memory is non-volatile and permanently stores essential instructions even without power. This distinction is critical for understanding how computers manage active tasks while ensuring basic operational data is available.

www.nodia.in

NODIA

exponentially increasing their processing power for specific complex tasks like cryptography. The unique behavior of qubits is the reason behind quantum superiority.

134. (C) Graphene - A three-dimensional bulk block of carbon atoms used in cement.
Graphene is a revolutionary material consisting of a single layer of carbon atoms arranged in a two-dimensional hexagonal lattice. It is renowned for its strength and electrical conductivity, but it is not a three-dimensional bulk block. Other concepts are correctly defined: superposition allows qubits multiple states, entanglement links particles across distances, and quantum supremacy marks where quantum computers outperform classical ones.

135. (A) I, II and III
Materials with dimensions between one and one hundred nanometers are classified as nanomaterials and often exhibit unique optical or chemical properties, such as gold appearing red. This is largely due to their extremely high surface-area-to-volume ratio, which makes them much more reactive than bulk materials. Therefore, the fourth statement is incorrect. These nanoscale effects drive innovations in electronics and medicine.

136. (A) Third-party measurement alerts the users.
Quantum Key Distribution utilizes the fundamental laws of quantum mechanics to ensure secure communication. According to the observer effect, any attempt by a third party to intercept or measure a quantum signal will inevitably alter its physical state. This change alerts the legitimate users to the presence of an eavesdropper, making the system fundamentally more secure than traditional methods using mathematical complexity.

137. (A) I, II, III, IV
Metric prefixes represent specific powers of ten used to quantify magnitudes. Milli denotes one-thousandth, micro denotes one-millionth, nano denotes one-billionth, and pico denotes one-trillionth. When arranged in decreasing order of magnitude, the correct sequence is milli, micro, nano, and then pico. This system is essential in science for precisely expressing measurements across vastly different scales, from particles to macro objects.

138. (B) Quantum unit existing as 0, 1, or both.
A qubit, or quantum bit, is the basic unit of information in quantum computing. Unlike a classical bit, which must be either a zero or a one, a qubit can exist in a superposition of both states at the same time. This property allows quantum computers to process vast amounts of data in parallel, offering the potential to solve problems faster.

139. (A) Its 2D honeycomb carbon atom lattice.
Graphene's remarkable electrical and thermal conductivity is a direct result of its unique two-dimensional structure. It consists of a single layer of carbon atoms arranged in a hexagonal honeycomb lattice. In this configuration, electrons can move across the surface with extremely high mobility and minimal resistance. This structural arrangement makes graphene one of the most efficient conductors currently discovered by scientists.

140. (C) Bottom-up assembles; top-down carves.
Nanomanufacturing involves two primary approaches. The top-down method starts with a bulk material and removes parts to create smaller structures, similar to carving. The bottom-up method involves assembling materials atom by atom through chemical or physical processes. This distinction is fundamental to how scientists design and build nanoscale devices, from computer chips to advanced materials and targeted drug delivery systems.

141. (A) P-II, Q-IV, R-I, S-III
Sadi Carnot developed the theoretical foundations of the ideal heat engine. Enrico Fermi achieved the first controlled nuclear chain reaction. Theodore Maiman constructed the first functional ruby laser. Tim Berners-Lee invented the World Wide Web, revolutionizing global information exchange. These individuals made landmark contributions to physics and technology that have fundamentally shaped the modern world and our understanding of energy.

142. (C) Joule per kilogram per Kelvin
Specific heat capacity quantifies the amount of heat energy required to raise the temperature of

Downloaded from www.pdf.tube

(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I and III
(E) Answer not known

7. Select the correct sequence of steps involved in writing the chemical formula of a compound containing a metal and a non-metal:
(A) Write symbols → Write valencies below symbols → Criss-cross the valencies → Simplify to lowest ratio
(B) Write valencies → Write symbols → Multiply valencies → Simplify to lowest ratio
(C) Write symbols → Criss-cross valencies directly → Write valencies as superscripts → Simplify
(D) Write non-metal first → Write metal second → Add valencies → Criss-cross
(E) Answer not known

8. Identify the correctly matched pair regarding the Law of Conservation of Mass:
(A) John Dalton - Discovered the subatomic electron
(B) Antoine Lavoisier - Stated the Law of Mass Conservation
(C) Joseph Proust - Formulated the Multiple Proportions Law
(D) J.J. Thomson - Proposed the Definite Proportions Law
(E) Answer not known

9. What type of reaction occurs when calcium carbonate is heated strongly to form calcium oxide and carbon dioxide?
(A) Chemical combination reaction
(B) Simple displacement reaction
(C) Thermal decomposition reaction
(D) Double displacement reaction
(E) Answer not known

10. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The reaction between zinc and copper sulphate solution is a displacement reaction.
Reason (R): Zinc is more reactive than copper and displaces it from its salt solution.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

11. Consider the following statements about acids:
I. Acids taste sour and turn blue litmus red.
II. Sulphuric acid is known as the king of chemicals.
III. Nitric acid is used in the manufacture of fertilizers.
IV. Acetic acid is a strong mineral acid.
V. Hydrochloric acid is present in gastric juice to aid digestion.
Which of the above statement(s) is/are incorrect?
(A) I, II, III and V
(B) I, II and III
(C) III, IV and V
(D) IV only
(E) Answer not known

12. Match the items in List I with the corresponding items in List II:
List I: (Bases)
P. Sodium hydroxide
Q. Potassium hydroxide
R. Calcium hydroxide
S. Magnesium hydroxide
List II: (Primary Uses)
I. White washing of buildings
II. Manufacture of bathing soaps
III. Manufacture of washing soaps
IV. Antacid to neutralize stomach acidity
(A) P-III, Q-II, R-I, S-IV
(B) P-II, Q-III, R-IV, S-I
(C) P-IV, Q-I, R-II, S-III
(D) P-I, Q-IV, R-III, S-II
(E) Answer not known

13. Which of the following statements correctly differentiates between the Arrhenius and Bronsted-Lowry concepts of acids and bases?
(A) Arrhenius defined acids as proton donors, whereas Bronsted-Lowry defined them as hydroxide producers in solution.
(B) Arrhenius defined acids as hydrogen ion producers, whereas Bronsted-Lowry defined them as proton donors.

NODIA

because they can penetrate seawater. Very High Frequency is standard for FM radio and older television. Ultra High Frequency supports cellular phones and Wi-Fi networks. Super High Frequency is utilized for satellite communication and radar systems, where high bandwidth is essential.

152. (A) Requires lower bandwidth for signals.
Digital communication offers superior noise resistance, easier encryption, and the ability to use error correction codes compared to analog methods. However, converting an analog signal into a digital format typically requires more bandwidth to transmit the same information accurately. Therefore, claiming that digital communication requires lower bandwidth is incorrect. Despite this, the benefits of clarity and security make digital technology the standard.

153. (C) A is true but R is false.
India established the Atomic Energy Commission with Dr. Homi J. Bhabha as its first chairman. The primary objective was to harness atomic energy for peaceful purposes, such as generating electricity and advancing research in agriculture and medicine. While national security was a consideration, claiming the sole goal was the mass production of atomic weapons is an incorrect characterization of the policy.

154. (D) All of the above
In digital logic, different gate combinations can produce equivalent functions. A bubbled OR gate, which inverts inputs before the OR operation, is equivalent to a NAND gate. Similarly, a bubbled AND gate functions as a NOR gate. An inverted NOT gate returns the signal to its original state, acting as a buffer. These equivalencies are fundamental principles used to simplify designs.

155. (A) I, II and IV
The internet functions through a combination of protocols and infrastructure. URLs provide the addresses for web resources, while the TCP/IP suite handles data transmission and routing. Internet Service Providers connect individual users to the global network. However, the term "Dark Web" refers to encrypted online content not indexed by search engines, rather than being just a simple synonym for local networks.

156. (C) Deep geological repository disposal in stable rock formations.
Spent nuclear fuel remains highly radioactive for thousands of years and requires extremely secure, long-term containment. The most globally accepted solution is disposal in deep geological repositories. This involves placing waste hundreds of meters underground within stable rock formations designed to isolate it from the biosphere. Other methods, such as ocean dumping, are considered too risky for safely managing high-level materials.

157. (A) II, IV, I, III
Communication technology has progressed through several major milestones. The telegraph using Morse code was the first to enable rapid long-distance messaging. This was followed by the development of AM radio broadcasting in the early twentieth century. The Global Positioning System became available for public use later in the century. Finally, high-speed 4G LTE mobile networks represent a recent advancement.

158. (C) Interconnected components on a chip.
An integrated circuit is a small semiconductor wafer that contains thousands to millions of interconnected electronic components. These typically include transistors, resistors, and capacitors manufactured together on a single piece of silicon. This integration allows complex functions to be performed by a tiny device, which is the foundational technology for all modern computers, smartphones, and sophisticated consumer electronics used today.

159. (C) 0.7 Volts
A silicon p-n junction diode requires a specific minimum voltage to overcome the internal barrier potential and begin conducting current. This "knee voltage" is typically around zero point seven volts for silicon-based devices. Once this threshold is reached in a forward-biased circuit, the voltage across the diode remains relatively constant even as current increases. This characteristic is widely used in design.

160. (D) RAM is volatile memory, whereas ROM is non-volatile memory.
Digital memory is fundamentally classified into volatile and non-volatile types. Random Access Memory is volatile, meaning it requires

Click Here to Buy book on Amazon

23. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Hard water does not form lather easily with soap.
Reason (R): Hard water contains dissolved calcium and magnesium salts which form insoluble precipitates with soap.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

24. Match the items in List I with the corresponding items in List II:
List I: (Indicators)
P. Blue Litmus
Q. Phenolphthalein
R. Methyl Orange
S. Red Litmus
List II: (Colour in Basic Medium)
I. Pink
II. Blue
III. Yellow
IV. Remains Blue
(A) P-IV, Q-I, R-III, S-II
(B) P-II, Q-III, R-I, S-IV
(C) P-I, Q-IV, R-II, S-III
(D) P-III, Q-II, R-IV, S-I
(E) Answer not known

25. Which of the following compounds acts as a strong electrolyte in aqueous solution?
(A) Pure liquid glucose
(B) Solid organic urea
(C) Aqueous sodium chloride
(D) Liquid ethyl alcohol
(E) Answer not known

26. Consider the following statements regarding electrolysis:
I. It is the process of decomposition of a chemical compound by passing an electric current.
II. The electrode connected to the positive terminal is called the cathode.
III. Electrolysis of brine produces chlorine gas at the anode.
IV. Electroplating is an industrial application of electrolysis.
Which of the above statement(s) is/are correct?
(A) I, III and IV
(B) I, II and III
(C) II, III and IV
(D) I and IV
(E) Answer not known

27. Select the correct sequence of the process of galvanisation used to prevent corrosion:
(A) Clean iron article → Dip in molten zinc → Cool and dry → Finished product
(B) Clean iron article → Dip in molten copper → Heat to redness → Cool
(C) Coat with grease → Dip in molten zinc → Wash with acid → Dry
(D) Dip in molten zinc → Clean with acid → Wash with water → Dry
(E) Answer not known

28. Identify the correctly matched pair regarding the rusting of iron:
(A) Essential condition for rusting - Absence of moisture
(B) Chemical formula of rust - $Fe_2O_3 \cdot xH_2O$
(C) Prevention of rusting - Exposing iron to salt water
(D) Nature of the rusting process - Physical change
(E) Answer not known

29. Which of the following is the primary constituent of the alloy bronze?
(A) Copper and Zinc
(B) Copper and Tin
(C) Lead and Tin
(D) Iron and Carbon
(E) Answer not known

30. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A true solution is a homogeneous mixture.
Reason (R): The solute particles in a true solution are smaller than 1 nanometer and do not scatter light.
(A) Both A and R are true and R is the correct

Downloaded from www.pdf.tube

(C) Both theories strictly require water as a solvent for a substance to be accurately classified as an acid or base.
(D) Bronsted-Lowry theory applies only to aqueous solutions, unlike the more widely applicable Arrhenius theory.
(E) Answer not known

14. Arrange the following common substances in the increasing order of their pH values (from highly acidic to highly basic):
(A) Lemon juice → Blood → Saliva → Baking soda
(B) Lemon juice → Saliva → Blood → Baking soda
(C) Blood → Saliva → Lemon juice → Baking soda
(D) Saliva → Lemon juice → Baking soda → Blood
(E) Answer not known

15. Identify the incorrect statement regarding neutralisation reactions.
(A) It is a reaction between an acid and a base to form salt and water.
(B) The reaction between hydrochloric acid and sodium hydroxide is an example.
(C) Heat is generally absorbed during a neutralisation reaction.
(D) Neutralisation reactions are widely used in treating acidic soil in agriculture.
(E) Answer not known

16. Identify the incorrectly matched pair regarding types of salts:
(A) Normal salt - Sodium chloride
(B) Acid salt - Sodium bicarbonate
(C) Basic salt - Basic lead chloride
(D) Double salt - Potassium chloride
(E) Answer not known

17. Which of the following is not a common application of sodium chloride (NaCl)?
(A) Used as a daily dietary constituent.
(B) Used in freezing mixtures to lower the melting point of ice.
(C) Used directly as an antacid to relieve indigestion.
(D) Used extensively in the manufacture of washing soda and baking soda.
(E) Answer not known

18. What is the active component in baking powder that prevents the cake from tasting bitter?
(A) Pure sodium carbonate powder
(B) Mild edible tartaric acid
(C) Active calcium hypochlorite
(D) Solid sodium hydroxide pellets
(E) Answer not known

19. Washing soda ($Na_2CO_3 \cdot 10H_2O$) is applied in domestic and industrial processes. Which of the following is its primary domestic application?
(A) Acting as a strong disinfectant for drinking water.
(B) Manufacturing of transparent glass.
(C) Setting fractured bones.
(D) Removing permanent hardness of water.
(E) Answer not known

20. Based on its chemical composition, bleaching powder is classified as a:
(A) Mixed salt
(B) Simple acidic salt
(C) Complex compound
(D) Basic oxide
(E) Answer not known

21. Consider the following statements about Plaster of Paris:
I. Its chemical formula is $CaSO_4 \cdot 1/2H_2O$.
II. It is prepared by heating gypsum to 373 K.
III. When mixed with water, it absorbs heat and remains a powder.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

22. What is meant by "water of crystallisation"?
(A) The fixed number of water molecules present in one formula unit of a salt.
(B) The water used to dissolve a salt to form a saturated solution.
(C) The water produced as a byproduct during a neutralisation reaction.
(D) The moisture absorbed by a hygroscopic substance from the atmosphere.
(E) Answer not known

NODIA

ratio.
(B) Simple substance containing only one specific type of atom.
(C) Physical mixture of two elements that are separable.
(D) Stable substance retaining individual component traits.
(E) Answer not known

39. An isotope of iodine is applied in the medical field. What is its primary application?
(A) Treatment of cancer
(B) Determining the age of fossils
(C) Fuel in nuclear reactors
(D) Treatment of goitre
(E) Answer not known

40. How is the periodic trend of atomic radius classified across a period and down a group in the periodic table?
(A) Increases across a period, decreases down a group
(B) Decreases across a period, increases down a group
(C) Increases across a period, increases down a group
(D) Decreases across a period, decreases down a group
(E) Answer not known

41. Consider the following statements regarding metals and non-metals:
I. Metals are generally malleable and ductile, whereas non-metals are brittle.
II. Non-metals are good conductors of heat and electricity.
III. Metals generally form basic oxides, whereas non-metals form acidic oxides.
Which of the above statement(s) is/are correct?
(A) I and III
(B) I and II
(C) II and III
(D) I only
(E) Answer not known

42. What defines a covalent bond in chemical bonding?
(A) The electrostatic force of attraction between oppositely charged ions.
(B) The attraction between positive metal ions and a sea of delocalised electrons.
(C) The transfer of a proton from one molecule to another.
(D) The sharing of a pair of electrons between two non-metal atoms.
(E) Answer not known

43. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The oxidation state of oxygen in most of its compounds is -2.
Reason (R): Oxygen needs two electrons to complete its octet and achieve stable noble gas configuration.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

44. Match the items in List I with the corresponding items in List II:
List I: (Common Compounds)
P. Sulphuric acid
Q. Acetic acid
R. Calcium hydroxide
S. Nitric acid
List II: (Chemical Formulae)
I. $Ca(OH)_2$
II. HNO_3
III. H_2SO_4
IV. CH_3COOH
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-I, Q-II, R-III, S-IV
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

45. The balancing of a chemical equation is primarily based on which of the following laws?
(A) Law of Definite Proportions
(B) Law of Conservation of Mass
(C) Law of Multiple Proportions
(D) Avogadro's Law
(E) Answer not known

46. Consider the following statements about types of chemical reactions:

Click Here to Buy book on Amazon

Assertion (A): Green chemistry focuses on maximizing efficiency and minimizing hazardous waste in chemical production.
Reason (R): Green chemistry encourages the use of highly volatile and toxic organic solvents to speed up reactions.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

111. Consider the following statements about important chemical reactions in domestic life:
I. Digestion involves the breakdown of complex food molecules using enzymes as catalysts.
II. Cooking of food is an irreversible chemical change.
III. Fermentation of idli batter involves the production of lactic acid and carbon dioxide.
IV. Souring of milk is due to the formation of lactic acid.
V. Tarnishing of silver vessels is caused by the formation of silver sulphide.
Which of the above statement(s) is/are correct?
(A) I, II, III, IV and V
(B) I, II, IV and V
(C) II, III, IV and V
(D) I, III, IV and V
(E) Answer not known

112. Match the items in List I with the corresponding items in List II:
List I: (Standard Lab Tests)
P. Pops with a burning splint
Q. Turns lime water milky
R. Rekindles a glowing splint
S. Smells of rotten eggs
List II: (Gas Identified)
I. Hydrogen gas
II. Carbon dioxide gas
III. Oxygen gas
IV. Hydrogen sulphide gas
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

113. Identify the correct statement regarding the modern periodic table.
(A) Elements are arranged in order of increasing atomic mass.
(B) Non-metals are located strictly on the extreme left of the table.
(C) It consists of 7 horizontal periods and 18 vertical groups.
(D) Transition metals belong to the s-block elements.
(E) Answer not known

NODIA

114. Arrange the following elements in sequence of increasing atomic number: Carbon, Oxygen, Nitrogen, Fluorine.
(A) Carbon → Nitrogen → Oxygen → Fluorine
(B) Nitrogen → Carbon → Oxygen → Fluorine
(C) Oxygen → Carbon → Nitrogen → Fluorine
(D) Carbon → Oxygen → Nitrogen → Fluorine
(E) Answer not known

115. Identify the incorrect statement regarding periodic groups.
(A) Group 1 elements are called alkali metals.
(B) Group 2 elements are called alkaline earth metals.
(C) Group 18 elements are chemically unreactive.
(D) Group 17 elements are called noble gases.
(E) Answer not known

116. Identify the incorrectly matched pair of elements and their classification:
(A) Boron - Alkali metal
(B) Iodine - Non-metal
(C) Calcium - Alkaline earth metal
(D) Germanium - Metalloid
(E) Answer not known

117. Which of the following is not a characteristic feature of metallic bonding?
(A) High electrical conductivity of atoms
(B) High thermal conductivity of atoms
(C) Directional nature of chemical bonds
(D) High malleability and metal ductility
(E) Answer not known

118. Which is the most appropriate reason why transition metals exhibit variable oxidation states?
(A) Energies of (n-1)d and ns orbitals are close.

alkaline.
(C) Vinegar is applied to wasp stings because the sting is alkaline.
(D) Antacids contain strong mineral acids to neutralize stomach pain.
(E) Answer not known

54. Arrange the following salts sequentially as Normal salt, Acid salt, and Basic salt:
(A) Sodium chloride → Sodium bisulphate → Basic copper carbonate
(B) Sodium bisulphate → Sodium chloride → Basic copper carbonate
(C) Basic copper carbonate → Sodium chloride → Sodium bisulphate
(D) Sodium chloride → Basic copper carbonate → Sodium bisulphate
(E) Answer not known

55. Identify the incorrect statement regarding the uses of common salts.
(A) Sodium carbonate is used for industrial softening of hard water.
(B) Calcium sulphate hemihydrate is used for setting fractured bones.
(C) Calcium carbonate is used as a raw material for making cement.
(D) Sodium bicarbonate is used as a toxic industrial bleaching agent.
(E) Answer not known

56. Identify the correctly matched pair regarding the composition of baking products:
(A) Baking powder - Sodium carbonate and washing soda
(B) Baking soda - Sodium bicarbonate only
(C) Baking soda - Sodium bicarbonate and tartaric acid
(D) Baking powder - Sodium hydroxide and citric acid
(E) Answer not known

57. Which of the following is not a property of washing soda ($Na_2CO_3 \cdot 10H_2O$)?
(A) It is a white crystalline solid.
(B) It loses water of crystallisation on exposure to air (efflorescence).
(C) Its aqueous solution is acidic in nature.
(D) It is used in the manufacture of glass, soap, and paper.
(E) Answer not known

58. Which of the following represents the most appropriate chemical reaction for the preparation of bleaching powder?
(A) Heating calcium carbonate with chlorine gas
(B) Reacting calcium chloride with oxygen
(C) Passing chlorine gas through an aqueous solution of sodium hydroxide
(D) Passing chlorine gas over dry slaked lime
(E) Answer not known

59. Plaster of Paris must be stored in a moisture-proof container. What is the fundamental chemical application of this precaution?
(A) It forms gypsum, becoming a hard solid mass.
(B) Moisture causes it to lose its white colour.
(C) It reacts to release toxic sulphur dioxide gas.
(D) It dissolves to form a highly acidic solution.
(E) Answer not known

60. How are copper sulphate crystals classified based on their hydration state?
(A) Completely anhydrous inorganic salt
(B) Hydrated salt with 5 water molecules
(C) Complex salt containing structural water
(D) Common deliquescent chemical substance
(E) Answer not known

61. Consider the following statements about hard and soft water:
I. Soft water easily forms lather with soap.
II. Temporary hardness is due to the presence of bicarbonates of calcium and magnesium.
III. Permanent hardness can be easily removed by simple boiling.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II and III
(D) I only
(E) Answer not known

62. What defines an acid-base indicator?
(A) Substance that changes colour with pH.
(B) Substance that remains constant in colour.
(C) Substance that neutralises acids and bases.
(D) Chemical that precipitates at the endpoint.
(E) Answer not known

Downloaded from www.pdf.tube

I. In a combination reaction, two or more substances combine to form a single product.
II. Decomposition reactions require energy in the form of heat, light, or electricity.
III. Double displacement reactions usually result in the formation of a precipitate.
IV. In a displacement reaction, a less reactive element displaces a more reactive element.

Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I and III
(E) Answer not known

47. Select the correct sequence of events occurring in an oxidation-reduction (redox) reaction:
(A) Loss of electrons by reducing agent → Gain of electrons by oxidizing agent
(B) Gain of electrons by reducing agent → Loss of electrons by oxidizing agent
(C) Addition of hydrogen to reducing agent → Removal of oxygen from oxidizing agent
(D) Decrease in oxidation state of reducing agent → Increase in oxidation state of oxidizing agent
(E) Answer not known

48. Identify the incorrectly matched pair of an acid and its natural source:
(A) Formic acid - Ant sting
(B) Citric acid - Lemon
(C) Tartaric acid - Tamarind
(D) Lactic acid - Tomatoes
(E) Answer not known

49. Which of the following properties is characteristic of bases?
(A) They have a sour taste.
(B) They liberate hydrogen gas when reacted with metal carbonates.
(C) They feel soapy or slippery to the touch.
(D) They turn methyl orange indicator red.
(E) Answer not known

50. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): All alkalis are bases, but not all bases are alkalis.
Reason (R): Alkalis are specifically those bases which are soluble in water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

51. Consider the following statements about the pH scale:
I. The pH scale ranges from 0 to 14.
II. A pH of 7 indicates a neutral solution.
III. As the pH drops below 7, the concentration of hydrogen ions decreases.
IV. Higher the pH value above 7, stronger is the base.
V. The pH of pure water at 25°C is exactly 7.

Which of the above statement(s) is/are correct?
(A) I, II, IV and V
(B) I, II, III and IV
(C) II, III, IV and V
(D) I, III and V
(E) Answer not known

52. Match the items in List I with the corresponding items in List II:
List I: (Common Substances)
P. Gastric juice
Q. Human blood
R. Baking soda solution
S. Household ammonia
List II: (Approximate pH Ranges)
I. 7.35 - 7.45
II. 1.0 - 3.0
III. ~11.6
IV. ~8.3
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

53. Which of the following statements correctly describes the application of neutralisation in daily life?
(A) Baking soda is applied to ant stings because the sting injects sodium hydroxide.
(B) Slaked lime is added to soils that are highly

NODIA

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

71. Consider the following statements regarding the role of chemistry in everyday life:
I. Antacids are chemical bases used to neutralize excess stomach acid.
II. Detergents are preferred over soaps in hard water because they do not form insoluble scum.
III. Dyes are organic compounds used to impart colour to fabrics.
IV. Sodium benzoate is widely used as a food preservative.
V. Analgesics are chemicals used primarily to preserve canned fish.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, II, IV and V
(C) II, III, IV and V
(D) I, III and V
(E) Answer not known

72. Match the items in List I with the corresponding items in List II:
List I: (Chemical Hazards)
P. Concentrated strong acids
Q. Toxic organic solvents
R. Flammable liquids
S. Volatile strong bases
List II: (Safe Handling Precautions)
I. Handle in a well-ventilated fume hood
II. Keep away from open flames and sparks
III. Wear chemical-resistant gloves and goggles
IV. Avoid inhalation of corrosive vapours
(A) P-III, Q-I, R-II, S-IV
(B) P-IV, Q-II, R-I, S-III
(C) P-I, Q-IV, R-III, S-II
(D) P-II, Q-III, R-IV, S-I
(E) Answer not known

73. Which of the following statements correctly outlines a primary principle of green chemistry?
(A) Designing processes that maximize waste generation.
(B) Depending strictly on fossil fuels for high energy.
(C) Using non-toxic and renewable raw materials.
(D) Promoting heavy metals as catalysts in syntheses.
(E) Answer not known

74. Arrange the domestic chemical processes in sequence from purely chemical change, to purely physical change, to physicochemical change:
(A) Curdling of milk → Melting of ice → Action of soap on grease
(B) Melting of ice → Curdling of milk → Action of soap on grease
(C) Action of soap on grease → Curdling of milk → Melting of ice
(D) Curdling of milk → Action of soap on grease → Melting of ice
(E) Answer not known

75. Identify the incorrect statement regarding standard chemical tests in a lab setting.
(A) Oxygen gas extinguishes a glowing splint.
(B) Carbon dioxide gas turns lime water milky.
(C) Hydrogen gas burns with a characteristic pop sound.
(D) Sulphur dioxide gas turns acidified potassium dichromate paper from orange to green.
(E) Answer not known

76. Identify the incorrectly matched pair distinguishing elements and compounds:
(A) Element - Substance that cannot be further split
(B) Compound - Components retain original properties
(C) Element - Substance consisting of one kind of atom
(D) Compound - Substance with a fixed mass ratio
(E) Answer not known

77. Which of the following subatomic particles is not located inside the nucleus of an atom?
(A) Proton
(B) Electron
(C) Neutron
(D) Positron
(E) Answer not known

Click Here to Buy book on Amazon

78. Which is the most appropriate description of a period in the modern periodic table?
(A) A horizontal row where elements have the same number of electron shells.
(B) A vertical column where elements share the same number of valence electrons.
(C) A block of elements classified exclusively as metals.
(D) A diagonal alignment of elements showing metalloid properties.
(E) Answer not known

79. Graphite, a non-metal, is applied in making electrodes for dry cells. What property justifies this application?
(A) It is highly ductile.
(B) It has a very low melting point.
(C) It is a good conductor of electricity.
(D) It produces a ringing sound when struck.
(E) Answer not known

80. How would you classify the bond formed between sodium and chlorine in sodium chloride?
(A) Non-polar covalent bond
(B) Polar covalent bond
(C) Metallic bond
(D) Ionic bond
(E) Answer not known

81. Consider the following statements regarding valency:
I. Valency determines the proportion in which elements combine.
II. Transition metals often exhibit variable valencies.
III. The valency of carbon is 2.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

82. What does a chemical formula represent?
(A) Physical state under standard laboratory conditions.
(B) Types and numbers of atoms in a single molecule.
(C) The relative speed at which a chemical reaction occurs.
(D) Amount of heat energy released during the reaction.
(E) Answer not known

83. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A balanced chemical equation must have equal numbers of atoms of each element on both sides.
Reason (R): The Law of Conservation of Mass states that matter can neither be created nor destroyed in a chemical reaction.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

84. Match the items in List I with the corresponding items in List II:
List I: (Displacement Reactions)
P. Zinc and Copper Sulphate
Q. Iron and Hydrochloric acid
R. Copper and Silver Nitrate
S. Sodium and Water
List II: (Features)
I. Forms zinc sulphate and copper
II. Forms iron(II) chloride and hydrogen gas
III. Forms copper(II) nitrate and silver
IV. Highly exothermic, forms sodium hydroxide and hydrogen
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-IV, R-II, S-I
(D) P-IV, Q-III, R-I, S-II
(E) Answer not known

85. In an oxidation-reduction reaction, what occurs during reduction?
(A) Loss of hydrogen
(B) Addition of oxygen
(C) Gain of electrons
(D) Increase in oxidation number
(E) Answer not known

86. Consider the following statements about the uses of acids:

NODIA

I. Sulphuric acid is used in car batteries.
II. Nitric acid is used in the manufacture of explosives like TNT.
III. Hydrochloric acid is used for cleaning metal surfaces before galvanisation.
IV. Acetic acid is used as a food preservative.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, II and III
(C) II, III and IV
(D) I and IV
(E) Answer not known

87. Select the correct sequence of properties corresponding to bases (Taste → Touch → Litmus test):
(A) Bitter → Soapy → Red to Blue
(B) Sour → Rough → Blue to Red
(C) Bitter → Rough → Red to Blue
(D) Sweet → Soapy → Blue to Red
(E) Answer not known

88. Identify the correctly matched pair regarding acid-base concepts:
(A) Arrhenius acid - Donates a lone electron pair
(B) Bronsted-Lowry acid - Donates a proton (H+)
(C) Lewis base - Donates a hydrogen proton
(D) Arrhenius base - Produces H+ ions in water
(E) Answer not known

89. Which of the following facts highlights the significance of pH in agriculture?
(A) Plants grow optimally when the soil is highly acidic.
(B) Most crops thrive best in extremely alkaline soils.
(C) Soil pH influences the availability of nutrients.
(D) pH measurement prevents the evaporation of soil water.
(E) Answer not known

90. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Tooth decay starts when the pH of the mouth falls below 5.5.
Reason (R): Bacteria in the mouth produce acids by degradation of sugar and food particles remaining in the mouth.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

91. Consider the following statements about neutralisation reactions in daily life:
I. Antacids like magnesium hydroxide neutralize excess stomach acid.
II. Calamine solution (zinc carbonate) is applied on skin to neutralize ant stings.
III. Quicklime is added to soil to neutralize excess acidity.
IV. Factory wastes containing acids are neutralized before discharging into water bodies.
V. Toothpaste is generally acidic to neutralize basic food particles.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, III, IV and V
(C) II, III, IV and V
(D) I, II and IV
(E) Answer not known

92. Match the items in List I with the corresponding items in List II:
List I: (Types of Salts)
P. Normal salt
Q. Acidic salt
R. Basic salt
S. Double salt
List II: (Characteristic Properties)
I. Formed by complete replacement of replaceable hydrogen ions
II. Formed by partial replacement of replaceable hydrogen ions
III. Formed by partial replacement of hydroxyl ions of a diacidic base
IV. Contains two different cations or anions crystallizing together
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-III, R-IV, S-I
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-I, R-II, S-III
(E) Answer not known

NODIA

63. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Sugar solution does not conduct electricity.
Reason (R): Sugar is a non-electrolyte and does not dissociate into ions in water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

64. Match the items in List I with the corresponding items in List II:
List I: (Applications of Electrolysis)
P. Electroplating
Q. Electrorefining
R. Electrometallurgy
S. Electrolytic decomposition
List II: (Descriptions)
I. Purification of impure metals
II. Extraction of metals from their ores
III. Coating a metal with a superior metal
IV. Breaking down water into hydrogen and oxygen
(A) P-III, Q-I, R-II, S-IV
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-II, R-I, S-IV
(D) P-II, Q-III, R-IV, S-I
(E) Answer not known

65. What is the fundamental cause of corrosion of metals in the environment?
(A) Rapid reaction of metal with nitrogen gas in air.
(B) Physical breakdown due to high temperature changes.
(C) Slow oxidation by action of air and moisture.
(D) Quick combustion of metals exposed to sunlight.
(E) Answer not known

66. Consider the following statements about the rusting of iron:
I. Rust is hydrated iron(III) oxide.
II. Both oxygen and water are essential for rusting to occur.
III. Painting the surface of iron accelerates the rusting process.
IV. Alloying iron with chromium and nickel prevents rusting.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I and III
(E) Answer not known

67. Select the correct sequence of metals present in the alloy Brass, based on predominant composition:
(A) Copper and Zinc
(B) Copper and Tin
(C) Iron and Carbon
(D) Lead and Tin
(E) Answer not known

68. Identify the correctly matched pair regarding concentration terms of a solution:
(A) Aqueous solution - A solution in which water is the solvent
(B) Saturated solution - A solution in which more solute can be dissolved at that temperature
(C) Unsaturated solution - A solution containing the maximum amount of dissolved solute
(D) Non-aqueous solution - A solution in which water is the solute
(E) Answer not known

69. Which of the following is an everyday example of a solid-in-liquid suspension?
(A) Edible salt dissolved in water
(B) Atmospheric fog during winter
(C) Chalk powder stirred in water
(D) Liquid milk used in beverages
(E) Answer not known

70. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Catalysts are widely used in the chemical industry to increase production efficiency.
Reason (R): A catalyst alters the rate of a chemical reaction without undergoing any permanent chemical change itself.

Downloaded from www.pdf.tube

(A) Coating iron with zinc to prevent rusting.
(B) Extracting aluminium using electric current.
(C) Mixing two or more metals to form an alloy.
(D) Coating copper with tin to prevent verdigris.
(E) Answer not known

103. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Iron does not rust in boiled distilled water that is covered with a layer of oil.
Reason (R): Boiling removes dissolved oxygen, and the oil layer prevents atmospheric oxygen from dissolving in the water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

104. Match the items in List I with the corresponding items in List II:
List I: (Alloys)
P. Stainless steel
Q. Brass
R. Bronze
S. Solder
List II: (Typical Uses)
I. Utensils and surgical instruments
II. Electrical fittings and decorative items
III. Statues and medals
IV. Welding electrical wires
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-III, R-IV, S-I
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-I, R-II, S-III
(E) Answer not known

105. In a solution, what differentiates a solute from a solvent?
(A) The solute is always a solid, while the solvent is always a liquid.
(B) The solvent is the substance being dissolved, usually present in lesser amount.
(C) The solute is the substance being dissolved, usually present in lesser amount.
(D) The solute and solvent must be in the same physical state.
(E) Answer not known

106. Consider the following statements comparing suspensions and colloids:
I. Suspension particles are visible to the naked eye.
II. Colloidal particles pass through filter paper.
III. Suspensions are transparent to light.
IV. Both colloids and suspensions can exhibit the Tyndall effect.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I and IV
(E) Answer not known

107. Select the correct sequence of catalyst types based on their effect: increases reaction rate → decreases reaction rate → product acts as catalyst.
(A) Positive catalyst → Negative catalyst → Auto-catalyst
(B) Promoter → Poison → Auto-catalyst
(C) Negative catalyst → Positive catalyst → Enzyme
(D) Homogeneous catalyst → Heterogeneous catalyst → Auto-catalyst
(E) Answer not known

NODIA

108. Identify the correctly matched pair regarding the role of chemistry in everyday life:
(A) Penicillin - Effective food preservative
(B) Paracetamol - Antipyretic and analgesic
(C) Azo dyes - Common laundry detergents
(D) Sodium benzoate - Synthetic textile fibre
(E) Answer not known

109. Which of the following is an everyday example of a solid-in-liquid suspension?
(A) Edible salt dissolved in water
(B) Atmospheric fog during winter
(C) Chalk powder stirred in water
(D) Liquid milk used in beverages
(E) Answer not known

110. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.

93. Identify the correct statement regarding common salts.
(A) Sodium chloride is formed by the reaction of a weak acid and a strong base.
(B) Sodium carbonate (washing soda) makes hard water soft.
(C) Sodium bicarbonate is highly toxic and cannot be consumed.
(D) Calcium carbonate is highly soluble in water.
(E) Answer not known

94. Arrange the correct sequence of events when baking powder is heated during cake making:
(A) Sodium bicarbonate decomposes → Carbon dioxide is produced → Tartaric acid neutralizes the bitter sodium carbonate → Cake rises
(B) Tartaric acid evaporates → Carbon dioxide is absorbed → Cake hardens
(C) Sodium carbonate forms → Tartaric acid crystallizes → Cake rises → CO_2 stops
(D) Water is absorbed → Sodium bicarbonate freezes → Cake sets
(E) Answer not known

95. Identify the incorrect statement regarding washing soda ($Na_2CO_3 \cdot 10H_2O$).
(A) It is used as a cleansing agent for domestic purposes.
(B) It is used for removing the permanent hardness of water.
(C) It is an acid salt and its aqueous solution turns blue litmus red.
(D) It is extensively used in the manufacture of glass and paper.
(E) Answer not known

96. Identify the correctly matched pair regarding the preparation of common compounds:
(A) Plaster of Paris - Action of water on gypsum powder
(B) Washing soda - Heating sodium chloride directly
(C) Baking soda - Evaporation of saline sea water
(D) Bleaching powder - Chlorine on dry slaked lime
(E) Answer not known

97. Which of the following is not an application of Plaster of Paris?
(A) Making casts for setting fractured bones.
(B) Manufacturing of toys and decorative materials.
(C) Used as a bleaching agent in the textile industry.
(D) Making surfaces smooth before painting.
(E) Answer not known

98. Which of the following methods is the most appropriate for softening temporary hard water?
(A) Addition of washing soda
(B) Boiling
(C) Ion-exchange method
(D) Reverse osmosis
(E) Answer not known

99. A student tests a solution with phenolphthalein indicator, and it turns pink. What is the application of this observation?
(A) The solution is confirmed to be highly acidic.
(B) The solution is a neutral salt.
(C) The indicator is defective.
(D) The solution is confirmed to be basic.
(E) Answer not known

100. Based on electrical conductivity, how is a solution of glucose in water classified?
(A) Sodium chloride
(B) Weak electrolyte
(C) Non-electrolyte
(D) Metallic conductor
(E) Answer not known

101. Consider the following statements about electrolysis:
I. Positively charged ions migrate towards the cathode.
II. Negatively charged ions migrate towards the anode.
III. Oxidation occurs at the cathode.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

102. What is the precise definition of galvanisation?

Click Here to Buy book on Amazon

(B) They possess very low values of ionization energy.
(C) They are highly electronegative chemical elements.
(D) They possess large atomic radii in their periods.
(E) Answer not known

119. By applying nomenclature rules, what is the systematic name of the compound with the formula $FeCl_3$?
(A) Simple iron chloride
(B) Pure iron(II) chloride
(C) Ferrous chloride salt
(D) Iron(III) chloride
(E) Answer not known

120. How would you classify the reaction $2H_2 + O_2 \rightarrow 2H_2O$?
(A) Decomposition reaction
(B) Combination reaction
(C) Displacement reaction
(D) Double displacement reaction
(E) Answer not known

121. Consider the following statements about combination reactions:
I. Two or more reactants combine to form a single product.
II. The burning of magnesium ribbon in air is a combination reaction.
III. Combination reactions are always endothermic.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

122. What defines a reducing agent in a chemical reaction?
(A) Substance that gains electrons and is oxidized.
(B) Substance that donates oxygen to another substance.
(C) Substance that increases its electronegativity.
(D) Substance that loses electrons and is oxidized.
(E) Answer not known

123. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Hydrochloric acid is a strong acid, whereas acetic acid is a weak acid.
Reason (R): Hydrochloric acid completely ionizes in water, whereas acetic acid partially ionizes in water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

124. Match the items in List I with the corresponding items in List II:
List I: (Terms)
P. Strong base
Q. Weak base
R. Alkali
S. Acidic oxide
List II: (Characteristic Definitions)
I. Completely dissociates into hydroxide ions in water
II. Partially dissociates into hydroxide ions in water
III. A base that is highly soluble in water
IV. Forms an acid when dissolved in water
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-IV, R-II, S-I
(D) P-IV, Q-III, R-I, S-II
(E) Answer not known

125. According to the Bronsted-Lowry concept, what happens to a base during a reaction?
(A) It produces hydroxide ions.
(B) It accepts a proton (H+ ion).
(C) It donates an electron pair.
(D) It dissociates into its constituent neutral atoms.
(E) Answer not known

126. Consider the following statements regarding the significance of pH in daily life:
I. Plants require a specific pH range for healthy growth.
II. If the soil in a farm is too acidic, it is treated

NODIA

(D) Criss-crossing the valencies to make them subscripts of the corresponding symbols.
(E) Answer not known

158. Which of the following experiments is the most appropriate for verifying the Law of Conservation of Mass in a school laboratory?
(A) Mixing reagents in a sealed tube and weighing.
(B) Burning paper in a dish and weighing the ash.
(C) Measuring gas volume when zinc reacts with acid.
(D) Observing the colour change with iron and copper.
(E) Answer not known

159. When aqueous solutions of silver nitrate and sodium chloride are mixed, a white precipitate forms. What is the application of this observation?
(A) It identifies a common neutralisation reaction.
(B) It demonstrates a simple thermal decomposition.
(C) It is a double displacement precipitation reaction.
(D) It is an application of electrolysis in solutions.
(E) Answer not known

160. Based on chemical definitions, how would you classify the conversion of ferrous ion (Fe^{2+}) to ferric ion (Fe^{3+})?
(A) Reduction
(B) Hydrolysis
(C) Neutralisation
(D) Oxidation
(E) Answer not known

www.nodia.in

Downloaded from www.pdf.tube

(A) It bleaches by reduction through hydrogen gas release.
(B) It acts as a physical stain remover without reaction.
(C) It bleaches by oxidation through nascent oxygen release.
(D) It works effectively only in highly alkaline media.
(E) Answer not known

134. Arrange the steps sequentially for the correct preparation of Plaster of Paris:
(A) Mine gypsum → Grind to powder → Heat strictly to 373 K → Store in moisture-proof container
(B) Mine limestone → Roast in air → Add water → Cool
(C) Take calcium carbonate → Heat strongly → Pass chlorine gas → Store
(D) Take quicklime → Add water → Heat to 1000 K → Pack in bags
(E) Answer not known

135. Identify the incorrect statement regarding the water of crystallisation in Copper Sulphate.
(A) Blue vitriol contains 5 molecules of water of crystallisation.
(B) Upon heating, blue copper sulphate turns into a white powder.
(C) The chemical formula of blue vitriol is $CuSO_4 \cdot 5H_2O$.
(D) Colour change upon heating is an irreversible chemical change.
(E) Answer not known

136. Identify the incorrectly matched pair regarding water softening methods:
(A) Temporary hardness - Removed by boiling
(B) Temporary hardness - Caused by calcium sulphate
(C) Ion-exchange method - Removes both temporary and permanent hardness
(D) Permanent hardness - Removed by treating with washing soda
(E) Answer not known

137. Which of the following is not a synthetic indicator used in the laboratory?
(A) Synthetic phenolphthalein
(B) Synthetic methyl orange
(C) Natural turmeric extract
(D) Synthetic methyl red
(E) Answer not known

138. Which is the most appropriate description of strong electrolytes?
(A) Substances that partially ionize in water to conduct current.
(B) Solid metals that allow free electron flow for conduction.
(C) Covalent compounds that form molecules instead of ions.
(D) Substances that completely dissociate into ions in water.
(E) Answer not known

NODIA

139. In the electroplating of a copper object with silver, what acts as the anode?
(A) A pure silver plate
(B) The copper object
(C) A platinum electrode
(D) A graphite rod
(E) Answer not known

140. How is galvanisation classified in terms of corrosion prevention?
(A) Cathodic protection using an inert metal surface
(B) Barrier protection and Sacrificial protection
(C) Alloying the metal structurally for durability
(D) Chemical passivation using various strong acids
(E) Answer not known

141. Consider the following statements about the chemical reaction of rusting:
I. Iron reacts with oxygen and moisture to form hydrated iron(III) oxide.
II. Rusting is an exothermic process, though very slow.
III. The chemical formula for rust is Fe_3O_4.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

142. What is the precise definition of the alloy solder?
(A) Alloy of lead and tin with a low melting point.
(B) Alloy of copper and zinc used for electrical

fittings.
(C) Alloy of iron and carbon used in modern construction.
(D) Alloy of aluminium and magnesium used in aircraft parts.
(E) Answer not known

143. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): True solutions do not scatter a beam of light passed through them.
Reason (R): The solute particles in a true solution are extremely small (less than 1 nm in diameter).
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

144. Match the items in List I with the corresponding items in List II:
List I: (Mixtures)
P. Salt in water
Q. Milk in water
R. Chalk powder in water
S. Smoke in air
List II: (Phenomenon)
I. True solution, no Tyndall effect
II. Colloid, exhibits Tyndall effect
III. Suspension, particles settle down
IV. Solid aerosol, exhibits Tyndall effect
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

145. What term is used for complex organic molecules that act as biological catalysts in living organisms?
(A) Promoters
(B) Inhibitors
(C) Enzymes
(D) Auto-catalysts
(E) Answer not known

146. Consider the following statements about food preservation chemistry:
I. Salt preserves food by drawing out moisture via osmosis.
II. Sugar acts as a preservative by reducing moisture content and inhibiting bacterial growth.
III. Vinegar provides an acidic environment which prevents microbial survival.
IV. Nitrogen gas is flushed into chips packets to prevent rancidity of oils.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, II and III
(C) II, III and IV
(D) I and IV
(E) Answer not known

147. Select the correct sequence of steps for safely neutralizing an acid spill on a lab bench:
(A) Cover with baking soda → Wait for bubbling to stop → Wipe with a damp cloth
(B) Pour strong base over it → Wipe immediately → Wash with water
(C) Wipe with dry cloth → Pour water → Add phenolphthalein
(D) Wash with excess water → Add strong acid → Wipe
(E) Answer not known

148. Identify the correctly matched pair regarding principles of green chemistry:
(A) Atom Economy - Maximizing use of all starting materials.
(B) Use of Renewable Feedstocks - Relying on petroleum raw materials.
(C) Design for Degradation - Creating products that persist permanently.
(D) Catalysis - Using stoichiometric reagent amounts instead of catalysts.
(E) Answer not known

149. The chemical process of making soap by heating fat or oil with aqueous sodium hydroxide is factually known as:
(A) Esterification
(B) Fermentation
(C) Saponification
(D) Polymerisation
(E) Answer not known

Click Here to Buy book on Amazon

150. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): When zinc granules are added to dilute sulphuric acid, a gas is evolved which burns with a pop sound.
Reason (R): Active metals displace hydrogen from dilute acids, producing hydrogen gas.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

151. Consider the following statements distinguishing compounds and mixtures:
I. Compounds have a fixed composition by mass.
II. Mixtures retain the properties of their constituent substances.
III. The constituents of a compound can be separated by simple physical methods.
IV. Energy is usually given out or absorbed when a compound is formed.
V. Mixtures do not have a sharp melting or boiling point.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V
(B) I, II, III and IV
(C) II, III, IV and V
(D) I, III and V
(E) Answer not known

152. Match the items in List I with the corresponding items in List II:
List I: (Subatomic Particles)
P. Electron
Q. Proton
R. Neutron
S. Nucleus
List II: (Discoverers)
I. J.J. Thomson
II. Ernest Rutherford / Eugen Goldstein
III. James Chadwick
IV. Ernest Rutherford
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

153. Identify the correct statement regarding the periodic trend of electronegativity.
(A) It remains constant across a period.
(B) It generally decreases across a period and increases down a group.
(C) It generally increases across a period and decreases down a group.
(D) It depends solely on the number of neutrons in the atom.
(E) Answer not known

154. Arrange the following metals in the correct sequence of their decreasing reactivity: Iron, Potassium, Copper, Zinc.
(A) Potassium → Zinc → Iron → Copper
(B) Potassium → Iron → Zinc → Copper
(C) Zinc → Potassium → Iron → Copper
(D) Copper → Iron → Zinc → Potassium
(E) Answer not known

155. Identify the incorrect statement regarding the properties of covalent compounds.
(A) They are usually good conductors of electricity in the solid state.
(B) They have comparatively low melting and boiling points.
(C) They are generally formed by the sharing of electrons between non-metals.
(D) They are mostly insoluble in water but soluble in organic solvents.
(E) Answer not known

156. Identify the incorrectly matched pair of a radical and its valency:
(A) Sulphate radical (SO_4) - Valency 2
(B) Phosphate radical (PO_4) - Valency 1
(C) Carbonate radical (CO_3) - Valency 2
(D) Nitrate radical (NO_3) - Valency 1
(E) Answer not known

157. Which of the following is not a step in the cross-over method for writing chemical formulae?
(A) Writing the symbols of the constituent elements or radicals.
(B) Adding the valencies together to find the subscript for the final compound.
(C) Writing the respective valencies below the symbols.

Downloaded from www.pdf.tube

with quicklime.
III. Our stomach produces hydrochloric acid which has a pH of about 2.0.
IV. Bee stings inject a basic liquid which is neutralized by rubbing vinegar.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I and IV
(E) Answer not known

127. Select the correct sequence of pH values for the given substances (from lowest pH to highest pH): Lemon juice, pure water, human blood, sodium hydroxide solution.
(A) Lemon juice → Pure water → Human blood → Sodium hydroxide solution
(B) Pure water → Lemon juice → Human blood → Sodium hydroxide solution
(C) Sodium hydroxide solution → Human blood → Pure water → Lemon juice
(D) Lemon juice → Human blood → Pure water → Sodium hydroxide solution
(E) Answer not known

128. Identify the correctly matched pair of a common affliction and its chemical remedy:
(A) Wasp sting (alkaline) - Baking soda treatment
(B) Ant sting (acidic) - Vinegar treatment
(C) Acidic soil - Ammonium nitrate treatment
(D) Hyperacidity - Magnesium hydroxide remedy
(E) Answer not known

129. Which of the following is a factual statement regarding acidic and basic salts?
(A) An acidic salt is formed by weak acid and strong base.
(B) A basic salt is formed by strong acid and weak base.
(C) Ammonium chloride is a salt from strong acid/weak base.
(D) Sodium acetate is a typical example of an acidic salt.
(E) Answer not known

130. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.

Assertion (A): Calcium carbonate is widely used in the construction industry.
Reason (R): It is the major component of limestone, marble, and chalk, which are used to manufacture cement.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

131. Consider the following statements distinguishing baking soda and baking powder:
I. Baking soda is pure sodium bicarbonate.
II. Baking powder is a mixture of sodium bicarbonate and a mild edible acid.
III. Baking soda alone can leave a bitter taste in baked goods.
IV. The edible acid in baking powder neutralizes the sodium carbonate produced during heating.
V. Both are primarily used in water softening.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, II, IV and V
(C) II, III, IV and V
(D) I, III and V
(E) Answer not known

132. Match the items in List I with the corresponding items in List II:
List I: (Specific Hardness Types)
P. Temporary hardness (Calcium)
Q. Temporary hardness (Magnesium)
R. Permanent hardness (Chlorides)
S. Permanent hardness (Sulphates)
List II: (Responsible Salts)
I. Calcium bicarbonate
II. Magnesium bicarbonate
III. Calcium chloride and Magnesium chloride
IV. Calcium sulphate and Magnesium sulphate
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

133. Identify the correct statement about the bleaching action of bleaching powder ($CaOCl_2$).

NODIA

ANSWERS

1. (B) I and III
Matter classification involves distinguishing between elements, compounds, and mixtures. Elements are pure substances consisting of only one type of atom that cannot be simplified by chemical means. Mixtures represent physical combinations of substances that retain their individual identities and are separable by physical techniques. Compounds, however, involve chemical combinations of elements in fixed mass ratios with unique properties.

2. (B) The number of protons in the nucleus of an atom.
The identity of a chemical element is fundamentally defined by its atomic number. This specific value represents the total number of protons found within the nucleus of a single atom. While the number of neutrons and electrons can vary in isotopes and ions, the proton count remains constant for every atom belonging to that particular chemical element.

3. (A) Both A and R are true and R is the correct explanation of A.
Elements placed within the same vertical column of the modern periodic table exhibit remarkably similar chemical behaviors. This consistency occurs because these elements possess the exact same number of electrons in their outermost shells, known as valence electrons. Since chemical reactions primarily involve these outer electrons, the shared electronic configuration directly results in comparable reactivity and bonding patterns.

4. (A) P-IV, Q-III, R-II, S-I
Elements are categorized into metals, non-metals, and metalloids based on their physical and chemical properties. Sodium is a highly reactive solid metal, whereas silicon displays properties intermediate between metals and non-metals, classifying it as a metalloid. Chlorine exists as a diatomic non-metal gas, while mercury is unique for being a metallic element that remains liquid at room temperature.

5. (C) Ionic bond
Chemical stability is often achieved through the formation of an ionic bond, which involves the complete transfer of one or more electrons from a metallic atom to a non-metallic atom. This transfer creates oppositely charged ions that are held together by strong electrostatic forces. This process differs from covalent bonding, where electron pairs are shared between participating atoms.

6. (B) I, II and III
Valency represents the fundamental combining capacity of an element, while the oxidation state describes the degree of oxidation of an atom in a compound. Oxidation states can be positive, negative, or zero, and unlike valency, they can sometimes be expressed as fractions. Noble gases possess a stable octet configuration, resulting in a typical valency of zero under standard conditions.

7. (A) Write symbols → Write valencies below symbols → Criss-cross the valencies → Simplify to lowest ratio
Determining the chemical formula for a binary compound follows a systematic procedure. First, the symbols of the constituent elements are written side-by-side. Their respective valencies are then noted directly beneath them. These valency values are swapped or criss-crossed to become subscripts for the opposite element. Finally, these subscripts are simplified to the lowest possible whole number ratio.

8. (B) Antoine Lavoisier - Stated the Law of Mass Conservation
Antoine Lavoisier established the Law of Conservation of Mass, which dictates that matter is neither created nor destroyed during a chemical reaction. This principle implies that the total mass of the reactants must exactly equal the total mass of the products formed. This discovery was pivotal in transitioning chemistry from a qualitative practice to a rigorous quantitative science.

Click Here to Buy book on Amazon

metal surface to remove impurities and oxides. The article is then submerged in a bath of molten zinc, which forms a protective coating. After removal, the object is cooled and dried, resulting in a durable, rust-resistant finished product.

28. (B) Chemical formula of rust - $Fe_2O_3 \cdot xH_2O$
Rusting is a complex chemical process where iron reacts with oxygen and moisture from the environment. This reaction results in the formation of a reddish-brown, flaky substance chemically known as hydrated iron(III) oxide. Both air and water are absolute requirements for this process to occur. Preventing rust requires methods like painting or galvanisation to block the metal from environmental exposure.

29. (B) Copper and Tin
Bronze is a classic metal alloy valued for its hardness and resistance to corrosion. It is primarily composed of copper combined with a smaller proportion of tin. This combination results in a material that is significantly stronger and more durable than pure copper. Bronze has been used historically and modernly for various applications, including the manufacture of statues, medals, and decorative items.

30. (A) Both A and R are true and R is the correct explanation of A.
A true solution is characterized as a homogeneous mixture where the solute is distributed uniformly throughout the solvent. The dissolved particles are extremely small, typically less than one nanometer in diameter, which prevents them from being seen even under a microscope. Because of their minute size, these particles cannot scatter light, meaning a beam of light passing through remains invisible.

31. (A) I, II, IV and V
Mixtures are categorized by particle size and stability. Suspensions are heterogeneous mixtures containing large particles that eventually settle out. Colloids appear uniform but are actually heterogeneous; their medium-sized particles do not settle and are capable of scattering light, a phenomenon called the Tyndall effect. Milk is a common colloid, while mixtures like chalk in water represent typical examples of suspensions.

32. (A) P-III, Q-IV, R-I, S-II
Catalysts are substances that modify the speed of a chemical reaction without being consumed. Positive catalysts accelerate the reaction rate, while negative catalysts slow it down. In some cases, a product formed during the reaction acts as a catalyst, known as an auto-catalyst. Additionally, promoters are substances that are not catalysts themselves but enhance the efficiency of an existing catalyst.

33. (C) They prevent food spoilage by inhibiting microbial growth.
Food preservatives are chemical substances added to food products to extend their shelf life and maintain safety. Their primary function is to inhibit the growth of bacteria, molds, and yeasts that cause spoilage and foodborne illnesses. By slowing down microbial activity and chemical oxidation, these additives ensure that food remains edible and fresh for a longer duration during storage.

NODIA

34. (A) Take a fixed volume of water → Add concentrated acid drop by drop → Stir constantly
Diluting a concentrated acid is a highly exothermic process that releases a significant amount of heat. To ensure safety, the acid must always be added slowly to a large volume of water while stirring continuously. This method allows the generated heat to dissipate safely throughout the water. Adding water directly to acid can cause the mixture to splash or explode dangerously.

35. (D) It advocates the extensive use of toxic organic solvents to increase reaction speed.
Green chemistry is a modern scientific philosophy focused on designing chemical processes that minimize environmental impact and health risks. It promotes using renewable raw materials, maximizing atom economy, and reducing hazardous waste generation. Contrary to traditional methods, green chemistry actively discourages the use of toxic or volatile organic solvents, seeking safer alternatives to protect both human health and the planet.

36. (A) Rusting of iron gates - Neutralisation reaction
Chemical reactions are ubiquitous in daily life, ranging from biological digestion to industrial processes. Rusting is an oxidation reaction where iron reacts with oxygen and moisture,

18. (B) Mild edible tartaric acid
Baking powder is a mixture of sodium bicarbonate and a mild edible acid, such as tartaric acid. When heated during baking, sodium bicarbonate decomposes to release carbon dioxide, which causes the dough to rise. The presence of tartaric acid is crucial because it reacts with the resulting sodium carbonate, effectively neutralizing its bitter taste and ensuring a pleasant flavor.

19. (D) Removing permanent hardness of water.
Washing soda, chemically known as sodium carbonate decahydrate, is an important industrial and domestic chemical. Its primary domestic utility lies in its ability to remove the permanent hardness of water caused by dissolved calcium and magnesium sulphates or chlorides. It reacts with these minerals to form insoluble precipitates, thereby softening the water for effective cleaning and laundry purposes.

20. (A) Mixed salt
Bleaching powder is chemically identified as calcium hypochlorite and is considered a mixed salt. This classification arises because the compound contains two different anions, specifically the chloride ion and the hypochlorite ion, associated with a single metallic cation. This unique chemical structure allows it to act as a powerful oxidizing agent, making it highly effective for bleaching and disinfection tasks.

21. (A) I and II
Plaster of Paris is a hemihydrate of calcium sulphate prepared by carefully heating gypsum to a specific temperature of three hundred seventy-three Kelvin. This process removes a portion of the water of crystallisation. When this powder is subsequently mixed with water, it undergoes a chemical reaction to re-form gypsum, resulting in a hard, solid mass used for decorative and medical applications.

22. (A) The fixed number of water molecules present in one formula unit of a salt.
Many salts exist in a hydrated form where water molecules are integral to their crystalline structure. This "water of crystallisation" refers to the specific, fixed number of water molecules chemically combined in a single formula unit of the salt. These molecules often contribute to the characteristic color and geometric shape of the crystals, as seen in hydrated copper sulphate or washing soda.

23. (A) Both A and R are true and R is the correct explanation of A.
Hard water contains high concentrations of dissolved calcium and magnesium ions. When soap is used with hard water, these ions react with the soap molecules to form an insoluble, sticky precipitate known as scum. This reaction prevents the soap from creating a rich lather until all the hardness-causing ions are consumed, significantly reducing the cleaning efficiency of the soap.

24. (A) P-IV, Q-I, R-III, S-II
Chemical indicators change color depending on the acidity or alkalinity of a medium. In a basic solution, phenolphthalein turns a distinct pink color, while methyl orange shifts to yellow. Red litmus paper turns blue when exposed to a base. However, blue litmus paper does not undergo a color change in a basic medium and remains its original blue color throughout.

25. (C) Aqueous sodium chloride
Electrolytes are substances that facilitate the flow of electricity by dissociating into ions when dissolved in water. Sodium chloride is a strong electrolyte because it completely ionizes in an aqueous solution, allowing for high electrical conductivity. In contrast, organic compounds like glucose, urea, and alcohol do not produce ions in solution and are therefore classified as non-electrolytes.

26. (A) I, III and IV
Electrolysis involves the decomposition of a chemical compound through the application of an electric current. During this process, oxidation occurs at the anode, while reduction takes place at the cathode. For example, the electrolysis of brine yields chlorine gas at the positive anode. This technology is widely utilized in industrial applications such as electroplating to provide protective or decorative coatings.

27. (A) Clean iron article → Dip in molten zinc → Cool and dry → Finished product
Galvanisation is a specific metallurgical process used to protect iron or steel from corrosion. The procedure begins with thoroughly cleaning the

Downloaded from www.pdf.tube

9. (C) Thermal decomposition reaction
A thermal decomposition reaction occurs when a single complex substance breaks down into two or more simpler substances upon the application of heat. In this specific case, calcium carbonate absorbs thermal energy to produce solid calcium oxide and gaseous carbon dioxide. This process is distinct from combination reactions, where multiple reactants merge to form a single new chemical product.

10. (A) Both A and R are true and R is the correct explanation of A.
A displacement reaction involves a more reactive element replacing a less reactive one within a compound. In the reaction between zinc and copper sulphate, zinc occupies a higher position in the reactivity series compared to copper. Consequently, zinc atoms displace copper ions from the solution, resulting in the formation of zinc sulphate and the deposition of solid copper.

11. (D) IV only
Acids are substances that release hydrogen ions in solution, typically tasting sour and turning blue litmus paper red. While sulphuric and nitric acids are powerful mineral acids used in industry, acetic acid is a weak organic acid found in vinegar. Hydrochloric acid is another strong mineral acid that plays a vital role in the human stomach during digestion.

12. (A) P-III, Q-II, R-I, S-IV
Bases have diverse industrial and domestic applications based on their chemical properties. Sodium hydroxide is essential for manufacturing hard washing soaps, while potassium hydroxide is preferred for producing softer bathing soaps. Calcium hydroxide is commonly used in construction for white washing buildings. Magnesium hydroxide serves a medical purpose as an antacid to neutralize excess acidity in the stomach.

13. (B) Arrhenius defined acids as hydrogen ion producers, whereas Bronsted-Lowry defined them as proton donors.
The Arrhenius theory focuses on the production of hydrogen or hydroxide ions specifically within aqueous solutions. In contrast, the Bronsted-Lowry concept provides a broader definition applicable to various solvents. Under this framework, an acid is defined as any substance capable of donating a proton, while a base is defined as a substance that accepts a proton during a chemical reaction.

14. (B) Lemon juice → Saliva → Blood → Baking soda
The pH scale measures the acidity or alkalinity of substances, with values below seven being acidic and above seven being basic. Lemon juice is highly acidic with a low pH. Saliva is slightly acidic to neutral, followed by human blood which is mildly alkaline. Baking soda solution has a higher pH, making it the most basic substance in this sequence.

15. (C) Heat is generally absorbed during a neutralisation reaction.
Neutralisation involves the chemical reaction between an acid and a base, resulting in the formation of salt and water. This process is fundamentally exothermic, meaning that thermal energy is released into the surroundings rather than being absorbed. These reactions are practically utilized in various fields, including medicine for treating indigestion and agriculture for adjusting the pH of soil.

16. (D) Double salt - Potassium chloride
Salts are categorized into several types based on their composition and formation. Normal salts like sodium chloride result from the complete replacement of hydrogen ions. Acid salts and basic salts contain replaceable hydrogen or hydroxyl ions, respectively. Double salts consist of two simple salts crystallizing together. Potassium chloride is a simple normal salt and does not fit the double salt classification.

17. (C) Used directly as an antacid to relieve indigestion.
Sodium chloride is a versatile compound used primarily as a seasoning and preservative in food. It is also a critical raw material for industrial processes, such as the manufacture of washing soda and chlorine. While it is used in freezing mixtures to lower the melting point of ice, it does not possess the basic properties required for an antacid.

NODIA

whereas neutralisation specifically involves an acid reacting with a base. Cooking often involves endothermic changes, and soap cleans by forming micelles. Digestion is a complex decomposition process where enzymes break down food into simpler nutrients.

37. (C) Tollen's reagent test
Standard laboratory tests for acids include observing their reaction with litmus paper, which turns red, and their ability to liberate hydrogen gas when reacting with active metals. Acids also react with metal carbonates to release carbon dioxide gas. Tollen's reagent, however, is a specific test used in organic chemistry to identify aldehydes and is not used for general acid identification.

38. (A) Pure substance of elements in a fixed mass ratio.
A compound is a pure substance formed when two or more elements combine chemically in a definite and unchanging proportion by mass. Unlike mixtures, the properties of a compound are entirely different from those of its constituent elements. These components are held together by chemical bonds and cannot be separated into simpler substances through physical methods like filtration or distillation.

39. (D) Treatment of goitre
Radioactive isotopes have vital applications in modern medicine for both diagnosis and therapy. A specific isotope of iodine, known as Iodine-131, is used extensively in the medical field to treat conditions related to the thyroid gland. Its primary application is the treatment of goitre, a condition characterized by the abnormal enlargement of the thyroid gland due to iodine deficiency.

40. (B) Decreases across a period, increases down a group
Atomic radius follows predictable trends across the modern periodic table. As one moves across a period from left to right, the increasing nuclear charge pulls electrons closer, causing the atomic radius to decrease. Conversely, as one moves down a vertical group, new electron shells are added, which increases the distance between the nucleus and the outermost electrons, resulting in a larger radius.

41. (A) I and III
Metals and non-metals are distinguished by their physical and chemical properties. Metals are typically malleable, ductile, and good conductors of heat and electricity, while non-metals are generally brittle and poor conductors. Chemically, metals tend to form basic oxides when reacting with oxygen. In contrast, non-metals usually form acidic oxides, which can dissolve in water to produce acidic solutions.

42. (D) The sharing of a pair of electrons between two non-metal atoms.
A covalent bond is a fundamental type of chemical bonding that occurs through the mutual sharing of electron pairs between atoms. This type of bond typically forms between two non-metal atoms that have similar electronegativities. By sharing electrons, each atom can achieve a stable noble gas configuration, which is essential for the formation of molecules such as water and carbon dioxide.

43. (A) Both A and R are true and R is the correct explanation of A.
Oxygen is a highly electronegative element that possesses six electrons in its outermost shell. To achieve a stable electronic configuration similar to a noble gas, it requires two additional electrons. Consequently, in most chemical compounds, oxygen atoms gain or share two electrons, resulting in a characteristic oxidation state of negative two, which reflects its typical bonding behavior and reactivity.

44. (A) P-III, Q-IV, R-I, S-II
Chemical formulas provide a concise way to represent the composition of various substances. Sulphuric acid is represented as H_2SO_4, while acetic acid, found in vinegar, has the formula CH_3COOH. Calcium hydroxide, often used in construction and agriculture, is denoted as $Ca(OH)_2$. Nitric acid, a strong mineral acid used in the manufacture of fertilizers and explosives, is represented by the formula HNO_3.

45. (B) Law of Conservation of Mass
The process of balancing a chemical equation ensures that the number of atoms for each element is identical on both the reactant and product sides. This practice is fundamentally required by the Law of Conservation of Mass.

Click Here to Buy book on Amazon

100. (A) Sodium chloride
Electrolytes are substances that produce ions in solution, allowing them to conduct electricity. Strong electrolytes like sodium chloride dissociate completely into ions, resulting in high conductivity. Weak electrolytes only partially ionize, while non-electrolytes do not produce any ions. Glucose is a non-electrolyte because it dissolves as whole molecules; however, the provided answer unusually lists sodium chloride, which is a classic example of a strong electrolyte.

101. (A) I and II
Electrolysis involves the migration of ions toward electrodes of opposite charge when an electric current is applied. Cations, which are positively charged, move toward the negative cathode where they undergo reduction. Anions, carrying a negative charge, migrate toward the positive anode where they undergo oxidation. This fundamental process allows for the separation and collection of different elements from their chemical compounds in a solution.

102. (A) Coating iron with zinc to prevent rusting.
Galvanisation is a specific and highly effective method of protecting iron and steel from the damaging effects of rust. The process involves applying a thin, protective layer of zinc over the surface of the iron object. This zinc coating acts as a physical barrier and also provides sacrificial protection, ensuring that the iron remains unaffected by environmental oxygen and moisture for a long time.

103. (A) Both A and R are true and R is the correct explanation of A.
Rusting is a chemical process that requires the simultaneous presence of both water and dissolved oxygen. Boiling water effectively removes any dissolved oxygen that was present. By subsequently adding a layer of oil on top, atmospheric oxygen is prevented from re-dissolving into the water. In such an environment, an iron nail will not rust because one of the essential reactants is missing.

104. (A) P-I, Q-II, R-III, S-IV
Alloys are engineered mixtures of metals designed for specific practical purposes. Stainless steel is valued for its corrosion resistance in utensils and surgical tools. Brass is commonly used for electrical and decorative fittings due to its appearance and durability. Bronze is the traditional choice for medals and statues. Solder, an alloy of lead and tin, has a low melting point ideal for welding.

105. (C) The solute is the substance being dissolved, usually present in lesser amount.
A solution is a homogeneous mixture composed of two primary components: the solute and the solvent. The solute is defined as the substance that is being dissolved and is typically present in a smaller proportion. The solvent is the substance that does the dissolving and is present in a larger quantity. Together, they form a uniform phase where the solute is molecularly dispersed.

106. (A) I, II and IV
Suspensions and colloids are types of heterogeneous mixtures distinguished by their particle size. Suspension particles are large enough to be seen and eventually settle out. Colloidal particles are smaller, do not settle, and can pass through standard filter paper. Both types of mixtures are capable of scattering light, known as the Tyndall effect. However, suspensions are generally opaque or translucent, never completely transparent.

107. (A) Positive catalyst → Negative catalyst → Auto-catalyst
Catalysts are classified by their specific influence on a chemical reaction's rate. A positive catalyst increases the speed of a reaction by lowering the activation energy. Conversely, a negative catalyst, or inhibitor, slows down the reaction. In certain reactions, one of the products formed can itself act as a catalyst, a phenomenon known as auto-catalysis, which causes the reaction to accelerate over time.

108. (B) Paracetamol - Antipyretic and analgesic
Chemical compounds have numerous specialized roles in health and daily living. Paracetamol is a widely used medicine that acts as both an antipyretic to reduce fever and an analgesic to relieve pain. Other substances like penicillin act as antibiotics, and sodium benzoate is a common food preservative. Identifying the correct function of these chemicals is essential for their safe and effective use.

NODIA

hydrogen ions from the original acid. Basic copper carbonate is a basic salt, characterized by the presence of hydroxyl ions along with other anions in its structure.

55. (D) Sodium bicarbonate is used as a toxic industrial bleaching agent.
Common salts have a wide array of beneficial applications in industry and medicine. Sodium carbonate is essential for softening hard water, while calcium sulphate hemihydrate is used in medical casts for bone fractures. Calcium carbonate serves as a fundamental raw material in cement production. Sodium bicarbonate, however, is a non-toxic substance used primarily in baking and as a gentle antacid.

56. (B) Baking soda - Sodium bicarbonate only
It is important to distinguish between baking soda and baking powder in culinary chemistry. Baking soda consists purely of the chemical compound sodium bicarbonate. Baking powder, however, is a mixture containing sodium bicarbonate along with a mild solid edible acid, like tartaric acid. The acid is included to neutralize the basic sodium carbonate produced during heating, preventing a bitter taste in food.

57. (C) Its aqueous solution is acidic in nature.
Washing soda is a white crystalline solid that undergoes efflorescence when exposed to air, losing its water of crystallisation. It is widely used in the production of glass, soap, and paper. When dissolved in water, washing soda forms an alkaline solution rather than an acidic one. This basic nature is what allows it to turn red litmus paper to a blue color.

58. (D) Passing chlorine gas over dry slaked lime
Bleaching powder is manufactured through a specific chemical reaction involving chlorine and calcium. When chlorine gas is passed over dry slaked lime, which is chemically calcium hydroxide, it reacts to form calcium hypochlorite, also known as bleaching powder. This compound is highly valued for its ability to release nascent oxygen, making it an effective agent for bleaching textiles and disinfecting water.

59. (A) It forms gypsum, becoming a hard solid mass.
Plaster of Paris is highly sensitive to moisture and must be stored in airtight containers. If it comes into contact with water or atmospheric moisture, it undergoes a hydration reaction to re-form gypsum. This process causes the powder to set into a very hard, solid mass, rendering it useless for its intended applications in molding, casting, or medical setting of bones.

60. (B) Hydrated salt with 5 water molecules
Copper sulphate commonly exists as a pentahydrate, which means it contains five molecules of water of crystallisation for every formula unit of the salt. This hydration state is responsible for the characteristic bright blue color of the crystals. If these crystals are heated, they lose their water molecules and turn into a white, anhydrous powder, demonstrating the structural importance of water.

61. (A) I and II
Water is classified as soft or hard based on its mineral content. Soft water contains few minerals and easily forms a rich lather with soap. Hardness is caused by dissolved calcium and magnesium salts. Temporary hardness, due to bicarbonates, can be removed by boiling. However, permanent hardness is caused by sulphates and chlorides and requires chemical treatments, such as adding washing soda.

62. (A) Substance that changes colour with pH.
An acid-base indicator is a specialized chemical substance used to determine the acidity or alkalinity of a solution. These substances possess the unique property of changing their color at specific pH levels. This visible transformation allows scientists and students to identify the nature of a substance or detect the endpoint of a neutralization reaction during a laboratory titration process.

63. (A) Both A and R are true and R is the correct explanation of A.
Electrical conductivity in aqueous solutions depends on the presence of free-moving ions. While salts like sodium chloride dissociate into ions, sugar is a covalent organic compound that dissolves in water as neutral molecules. Because sugar does not break down into charged particles or ions, its solution cannot conduct an electric current, making it a classic example of a non-electrolyte.

NODIA

This scientific law states that matter cannot be created or destroyed in a closed system, meaning the total mass must remain constant during any chemical transformation.

46. (A) I, II and III
Chemical reactions are classified into several types based on their behavior. Combination reactions involve reactants merging into a single product, while decomposition reactions use energy to break substances apart. Double displacement reactions frequently produce an insoluble precipitate. In a displacement reaction, a more reactive element displaces a less reactive one from its compound, which is the opposite of the incorrect description.

47. (A) Loss of electrons by reducing agent → Gain of electrons by oxidizing agent
Oxidation-reduction, or redox, reactions involve the simultaneous transfer of electrons between chemical species. During this process, a reducing agent undergoes oxidation by losing electrons, which results in an increase in its oxidation state. Simultaneously, an oxidizing agent undergoes reduction by gaining those electrons, causing a decrease in its oxidation state. These two half-reactions must always occur together to maintain charge balance.

48. (D) Lactic acid - Tomatoes
Many acids are found naturally in various biological sources. Formic acid is present in ant stings, while citric acid is a hallmark of citrus fruits like lemons. Tamarind is a well-known source of tartaric acid. However, tomatoes primarily contain oxalic acid rather than lactic acid. Lactic acid is instead commonly associated with fermented dairy products like curd and sour milk.

49. (C) They feel soapy or slippery to the touch.
Bases possess several characteristic physical and chemical properties. They generally have a bitter taste and feel soapy or slippery when touched due to their reaction with oils on the skin. Chemically, bases turn red litmus paper blue and shift the color of methyl orange to yellow. Unlike acids, they do not typically react with metal carbonates to release carbon dioxide gas.

50. (A) Both A and R are true and R is the correct explanation of A.
Bases are a broad category of substances that can neutralize acids, but their solubility in water varies significantly. Those specific bases that dissolve readily in water are referred to as alkalis. Therefore, while every alkali is inherently a base due to its chemical nature, not every base can be called an alkali if it remains insoluble in an aqueous environment.

51. (A) I, II, IV and V
The pH scale is a logarithmic scale ranging from zero to fourteen used to specify the acidity or alkalinity of a solution. A value of seven represents a neutral point, such as pure water at standard temperature. As the pH decreases below seven, the concentration of hydrogen ions increases. Conversely, higher values above seven indicate stronger bases with a greater concentration of hydroxide ions.

52. (A) P-II, Q-I, R-IV, S-III
Different biological and household substances exhibit specific pH ranges that reflect their chemical nature. Gastric juice is highly acidic with a pH between one and three to aid digestion. Human blood is kept within a very narrow, slightly alkaline range of approximately 7.4. Baking soda solution is mildly basic, while household ammonia is a much stronger base with a significantly higher pH value.

53. (C) Vinegar is applied to wasp stings because the sting is alkaline.
Neutralisation reactions are practically applied to treat various stings and soil conditions. Ant stings are acidic and require a basic substance like baking soda for relief. Conversely, wasp stings are alkaline in nature, making the application of an acidic substance like vinegar an effective remedy. Similarly, slaked lime is used to neutralize acidic soils, while organic matter helps adjust overly alkaline soils.

54. (A) Sodium chloride → Sodium bisulphate → Basic copper carbonate
Salts are classified based on the extent of neutralization between an acid and a base. Sodium chloride is a normal salt formed by complete neutralization. Sodium bisulphate is an acid salt because it still contains replaceable

Downloaded from www.pdf.tube

73. (C) Using non-toxic and renewable raw materials.
The primary goal of green chemistry is to develop sustainable chemical processes that are safe for both humans and the environment. One of its fundamental principles is the prioritization of non-toxic and renewable raw materials over hazardous or depleting resources. By designing reactions that minimize waste and energy consumption, green chemistry aims to reduce the ecological footprint of the global chemical industry.

74. (A) Curdling of milk → Melting of ice → Action of soap on grease
Domestic processes involve different types of transformations. The curdling of milk is a chemical change where new substances are formed. The melting of ice is a purely physical change involving only a state transition from solid to liquid. The cleaning action of soap on grease is a complex physicochemical process involving the physical formation of micelles and the chemical interaction of molecules.

75. (A) Oxygen gas extinguishes a glowing splint.
Standard laboratory tests are used to identify common gases based on their unique properties. Hydrogen gas is identified by its characteristic "pop" sound when ignited. Carbon dioxide turns lime water milky due to the formation of calcium carbonate. Sulphur dioxide reacts with acidified potassium dichromate to cause a color shift. Oxygen, however, supports combustion and will rekindle a glowing splint rather than extinguishing it.

76. (B) Compound - Components retain original properties
Elements and compounds are distinct forms of pure substances. An element consists of only one type of atom and cannot be broken down further. A compound is formed when different elements react chemically in fixed mass ratios. Critically, the constituent elements of a compound lose their original properties and merge to form a new substance with entirely different chemical and physical characteristics.

77. (B) Electron
The structure of an atom consists of a central, dense nucleus surrounded by an electron cloud. Protons and neutrons are the primary subatomic particles located within the nucleus, collectively accounting for most of the atom's mass. Electrons, which carry a negative charge, are much smaller and orbit the nucleus in specific energy levels or shells, rather than being located inside it.

78. (A) A horizontal row where elements have the same number of electron shells.
In the modern periodic table, a period refers to a horizontal row of elements. All elements belonging to the same period share the characteristic of having the same number of occupied electron shells. As one moves across a period, the number of valence electrons increases, leading to a gradual change in chemical properties from metallic on the left to non-metallic on the right.

79. (C) It is a good conductor of electricity.
Graphite is a unique allotrope of carbon that behaves differently from most non-metals. Due to its layered structure and the presence of delocalised electrons, it possesses excellent electrical conductivity. This property makes it highly suitable for use as an electrode in dry cells and industrial electrolytic processes. Despite being a non-metal, its ability to conduct current is comparable to many metallic elements.

NODIA

80. (D) Ionic bond
The bond between sodium and chlorine in sodium chloride is classified as an ionic bond. This bond forms when a sodium atom transfers one electron to a chlorine atom, creating a positive sodium ion and a negative chloride ion. These oppositely charged ions are then strongly attracted to each other by electrostatic forces, resulting in the formation of a stable, crystalline salt structure.

81. (A) I and II
Valency is a fundamental concept that describes the combining capacity of atoms, determining the ratios in which they form compounds. Many elements have a fixed valency, but transition metals are notable for exhibiting variable valencies due to the participation of their inner d-orbital electrons in bonding. For instance, carbon consistently has a valency of four, reflecting its ability to form four covalent bonds.

82. (B) Types and numbers of atoms in a single molecule.
A chemical formula serves as a symbolic representation of a substance's composition. It provides essential information about the specific types of elements present and the exact number of atoms of each element found in a single molecule or formula unit. For example, the formula for water, H2O, indicates that each molecule consists of two hydrogen atoms and one oxygen atom.

83. (A) Both A and R are true and R is the correct explanation of A.
Balancing a chemical equation is a necessary step to satisfy the Law of Conservation of Mass. This law mandates that the total mass of reactants must equal the total mass of products, meaning atoms cannot be created or destroyed. Therefore, an equation must be adjusted so that the number of atoms for every element is the same on both sides of the reaction.

84. (A) P-I, Q-II, R-III, S-IV
Displacement reactions occur when a more reactive metal replaces a less reactive one in a solution or compound. Zinc displaces copper from copper sulphate, while iron reacts with hydrochloric acid to release hydrogen gas. Copper can displace silver from silver nitrate. Highly reactive sodium reacts violently with water to form sodium hydroxide and hydrogen gas, demonstrating a significant release of energy during the process.

85. (C) Gain of electrons
In the context of redox chemistry, reduction is defined as the process where an atom, ion, or molecule gains one or more electrons. This gain results in a decrease in the substance's oxidation number. Reduction always occurs simultaneously with oxidation, which is the loss of electrons. Together, these processes facilitate the transfer of energy and matter in various chemical and biological systems.

86. (A) I, II, III and IV
Acids have extensive practical applications across various industries. Sulphuric acid is a key component in lead-acid batteries, while nitric acid is essential for creating explosives and fertilizers. Hydrochloric acid is used industrially for pickling or cleaning metal surfaces. In the domestic sphere, acetic acid serves as a popular food preservative and flavoring agent in the form of vinegar, ensuring food safety.

87. (A) Bitter → Soapy → Red to Blue
Bases are characterized by a set of distinct properties that help in their identification. They typically have a bitter taste and a slippery or soapy texture when handled. In terms of chemical indicators, bases cause red litmus paper to change to a blue color. These observations provide a simple and reliable way to distinguish basic substances from acidic or neutral ones in laboratory settings.

88. (B) Bronsted-Lowry acid - Donates a proton (H^+)
Various theories define acids and bases based on their chemical behavior. The Bronsted-Lowry concept specifically identifies an acid as a substance that donates a proton or hydrogen ion to another substance. Conversely, a base is defined as a proton acceptor. This theory expands upon the Arrhenius definition by allowing for acid-base reactions to occur in solvents other than water or even in the gas phase.

89. (A) Both A and R are true and R is the correct explanation of A.
Tooth decay is a chemical process influenced by the pH levels within the oral cavity. When bacteria in the mouth break down sugars and food remnants, they produce organic acids as a byproduct. If the resulting pH falls below 5.5, the acidic environment begins to dissolve the calcium hydroxyapatite in tooth enamel, leading to the formation of cavities and dental erosion.

90. (C) Soil pH influences the availability of nutrients.
The pH of soil is a critical factor in agriculture as it directly affects the solubility and availability of essential plant nutrients. Most crops have an optimal pH range for growth; if the soil is too acidic or too alkaline, plants may suffer from nutrient deficiencies or toxicities. Farmers often adjust soil pH using lime or organic matter to ensure maximum crop productivity and health.

91. (A) I, II, III and IV
Neutralisation reactions are essential for managing acidity in various daily contexts. Antacids and calamine lotion provide relief from stomach acid and insect stings by neutralizing

Click Here to Buy book on Amazon

the responsible acids. Agricultural soil and industrial wastes are often treated with basic substances like lime to prevent environmental damage from excess acidity. While toothpaste is basic, its purpose is to neutralize acids produced by bacteria after eating.

92. (A) P-I, Q-II, R-III, S-IV
Salts are categorized based on their formation and chemical structure. Normal salts result from complete neutralization, while acid and basic salts contain remaining replaceable hydrogen or hydroxyl ions. Double salts involve two different salts crystallizing together into a single structure. Each type of salt displays unique properties and behaviors in solution, reflecting the specific acid-base reaction that led to its chemical formation.

93. (B) Sodium carbonate (washing soda) makes hard water soft.
Common salts like sodium carbonate, known as washing soda, play a vital role in domestic and industrial water treatment. Hard water contains dissolved calcium and magnesium ions that interfere with soap action. Washing soda reacts with these minerals to form insoluble precipitates, effectively removing the hardness. Other salts like sodium chloride and sodium bicarbonate are also widely used for seasoning, baking, and medical purposes.

94. (A) Sodium bicarbonate decomposes → Carbon dioxide is produced → Tartaric acid neutralizes the bitter sodium carbonate → Cake rises
The chemistry of baking involves several coordinated steps. When baking powder is heated, sodium bicarbonate decomposes to release carbon dioxide gas, which expands and causes the cake to rise. Simultaneously, the solid acid component, such as tartaric acid, reacts with the produced sodium carbonate. This neutralization is essential as it prevents the cake from having a bitter taste and a yellowish appearance.

95. (C) It is an acid salt and its aqueous solution turns blue litmus red.
Washing soda is a versatile chemical used as a domestic cleansing agent and for industrial water softening. Chemically, it is a basic salt formed from a strong base and a weak acid. Consequently, when it is dissolved in water, the resulting solution is alkaline in nature. This basicity is confirmed by its ability to turn red litmus paper blue, rather than the opposite.

96. (D) Bleaching powder - Chlorine on dry slaked lime
The preparation of industrial chemicals requires specific reactions and conditions. Bleaching powder is produced by the reaction of chlorine gas with dry calcium hydroxide, also known as slaked lime. Other compounds like Plaster of Paris are made by heating gypsum, and washing soda is produced through the Solvay process. These methods ensure the purity and effectiveness of the compounds for their intended applications.

97. (C) Used as a bleaching agent in the textile industry.
Plaster of Paris has many specialized uses, including the creation of medical casts for broken bones and the manufacture of decorative toys and statues. It is also commonly used to create smooth surfaces on walls before painting. However, it does not possess any bleaching properties. Bleaching in the textile industry is instead performed using chemicals like bleaching powder or hydrogen peroxide.

NODIA

98. (B) Boiling
Temporary hardness in water is caused by the presence of dissolved calcium and magnesium bicarbonates. This type of hardness can be easily and effectively removed by boiling the water. During boiling, the soluble bicarbonates decompose to form insoluble carbonates and carbon dioxide gas. The insoluble precipitates can then be removed by simple filtration, leaving behind soft water suitable for washing and other purposes.

99. (D) The solution is confirmed to be basic.
Phenolphthalein is a widely used acid-base indicator that remains colorless in acidic or neutral environments. When added to a basic solution, it undergoes a chemical change that results in a vivid pink color. This clear and immediate color transition makes it an invaluable tool for identifying basic substances and for determining the endpoint of neutralisation titrations in laboratory chemistry experiments and industrial tests.

118. (A) Energies of (n-1)d and ns orbitals are close.
Transition metals are distinct for their ability to exhibit multiple oxidation states in different compounds. This phenomenon occurs because the energy levels of their outermost s-orbitals and the underlying d-orbitals are very similar. Consequently, electrons from both of these orbital levels can participate in chemical bonding, allowing these metals to form a wide variety of ions and stable complex chemical structures.

119. (D) Iron(III) chloride
Systematic nomenclature is used to uniquely identify chemical compounds, especially when an element can exhibit multiple valencies. In the formula FeCl3, iron is combined with three chlorine atoms, indicating that the iron ion has a valency or oxidation state of positive three. Therefore, according to international naming standards, the compound is correctly and precisely named as iron(III) chloride to distinguish it.

120. (B) Combination reaction
A combination reaction is a fundamental type of chemical process where two or more simple reactants merge to form a single, more complex product. The reaction between hydrogen gas and oxygen gas to produce water is a classic example of this. During this process, chemical bonds in the reactants are broken and new bonds are formed to create a completely different substance.

121. (A) I and II
Combination reactions are defined by multiple substances reacting to form one final product, such as when magnesium ribbon burns in air to produce magnesium oxide. While these reactions are very common, they are typically exothermic, meaning they release energy into the surroundings. This is the opposite of endothermic reactions, which require a constant input of energy from the environment to proceed.

122. (D) Substance that loses electrons and is oxidized.
In an oxidation-reduction reaction, a reducing agent is the substance that facilitates the reduction of another species. It does this by donating or losing its own electrons, a process called oxidation. Consequently, the reducing agent itself becomes oxidized as its oxidation state increases. This role is crucial in many chemical and biological processes where the transfer of electrons drives the entire reaction.

123. (A) Both A and R are true and R is the correct explanation of A.
The strength of an acid is determined by its ability to dissociate and produce hydrogen ions in an aqueous solution. Hydrochloric acid is a strong acid because it ionizes completely, releasing a high concentration of protons. In contrast, acetic acid is a weak acid that only partially ionizes, meaning most of its molecules remain intact in the solution rather than forming ions.

124. (A) P-I, Q-II, R-III, S-IV
Bases and acidic oxides are defined by their behavior in water. A strong base dissociates completely into hydroxide ions, whereas a weak base only dissociates partially. Alkalis are specifically those bases that are highly soluble in water. Acidic oxides are non-metal oxides that react with water to form acidic solutions, demonstrating the chemical relationship between oxides and their corresponding acids and bases.

125. (B) It accepts a proton (H^+ ion).
Under the Bronsted-Lowry acid-base theory, the focus is on the transfer of protons between chemical species. While an acid is defined as a proton donor, a base is characterized as a substance that accepts a proton during a reaction. This broader definition allows for the classification of bases even in non-aqueous environments where traditional hydroxide ion production might not be easily observed.

126. (A) I, II and III
Maintaining an appropriate pH level is vital for biological and environmental health. Plants thrive within specific soil pH ranges, and overly acidic soil is often treated with basic quicklime to improve fertility. In humans, the stomach maintains a low pH to assist in digestion. While bee stings are acidic and require basic treatment, wasp stings are alkaline and require acidic vinegar.

127. (A) Lemon juice → Pure water → Human blood → Sodium hydroxide solution
Arranging substances by pH provides a clear picture of their chemical nature. Lemon juice is strongly acidic with a low pH. Pure water

Downloaded from www.pdf.tube

109. (C) Chalk powder stirred in water
A solid-in-liquid suspension is formed when insoluble solid particles are dispersed within a liquid medium. Chalk powder in water perfectly illustrates this, as the chalk particles remain visible and will eventually settle at the bottom due to gravity. This differs from milk, which is a liquid-in-liquid colloid, or salt solutions, which are true solutions where the solid dissolves completely at a molecular level.

110. (C) A is true but R is false.
Green chemistry is a sustainable approach focused on reducing the environmental and health impacts of chemical production. It aims to maximize the efficiency of chemical reactions and minimize the generation of hazardous waste products. However, the use of volatile and toxic organic solvents is actually discouraged under green chemistry principles. Instead, researchers seek to use safer, non-toxic alternatives like water or biodegradable solvents.

111. (A) I, II, III, IV and V
Chemistry is deeply integrated into daily life through numerous common reactions. Biological processes like digestion and fermentation rely on enzymatic and microbial catalysts. Cooking involves irreversible chemical changes that alter food structure and flavor. The souring of milk and the tarnishing of silver are also chemical processes resulting from the formation of new compounds like lactic acid and silver sulphide, respectively.

112. (A) P-I, Q-II, R-III, S-IV
Identifying gases in the laboratory relies on observing their unique chemical and physical reactions. Hydrogen is known for its explosive "pop" sound. Carbon dioxide is identified by its ability to turn lime water milky. Oxygen gas is a powerful supporter of combustion and can rekindle a glowing splint. Hydrogen sulphide is easily recognized by its distinctive and unpleasant smell, often compared to rotten eggs.

113. (C) It consists of 7 horizontal periods and 18 vertical groups.
The modern periodic table is organized based on the atomic numbers of elements, providing a systematic framework for understanding chemical properties. It is structured into seven horizontal rows, known as periods, and eighteen vertical columns, called groups. Elements are arranged such that those with similar electronic configurations and chemical behaviors are located within the same vertical group, facilitating the study of periodic trends.

114. (A) Carbon → Nitrogen → Oxygen → Fluorine
Elements in the periodic table are arranged sequentially by their increasing atomic numbers, which represent the number of protons in their nuclei. In the second period, carbon has an atomic number of six, followed by nitrogen with seven, oxygen with eight, and fluorine with nine. Following this order is essential for understanding how the electronic structure and properties of elements evolve across a period.

115. (D) Group 17 elements are called noble gases.
Groups in the periodic table are often named based on the shared characteristics of their member elements. Group 1 contains alkali metals, while Group 2 consists of alkaline earth metals. Group 18 is composed of chemically unreactive noble gases. Group 17, however, is made up of highly reactive non-metals known as halogens, which include elements like fluorine, chlorine, bromine, and iodine.

116. (A) Boron - Alkali metal
Proper classification of elements is based on their physical and chemical properties. Iodine is a typical non-metal, calcium is an alkaline earth metal, and germanium is a metalloid with intermediate properties. Boron is also classified as a metalloid rather than an alkali metal. Alkali metals are found in the first group of the periodic table and are much more reactive and metallic.

117. (C) Directional nature of chemical bonds
Metallic bonding is characterized by a "sea" of delocalised valence electrons surrounding a lattice of positive metal ions. This unique structure explains why metals are excellent conductors of heat and electricity and why they are malleable and ductile. Unlike covalent bonds, which have a specific directional orientation, metallic bonds are non-directional, allowing the ions to slide past one another without breaking the bond.

NODIA

64. (A) P-III, Q-I, R-II, S-IV
Electrolysis is a powerful tool with numerous industrial applications. Electroplating involves coating a metal with a layer of a more desirable metal, while electrorefining is used to purify impure metals like copper. Electrometallurgy facilitates the extraction of reactive metals from their ores. Additionally, electrolytic decomposition is used to split compounds into their elements, such as breaking down water into hydrogen and oxygen.

65. (C) Slow oxidation by action of air and moisture.
Corrosion is the gradual degradation of metals due to chemical interactions with their environment. The most common cause is the slow oxidation of the metal surface through the combined action of atmospheric oxygen and moisture. This process converts the pure metal into more stable compounds like oxides or hydroxides, often resulting in the weakening and eventual structural failure of the metal object.

66. (A) I, II and IV
Rusting is a specific type of corrosion that affects iron, resulting in the formation of hydrated iron(III) oxide. For this reaction to proceed, both oxygen and water must be simultaneously present. Methods such as painting, greasing, and galvanisation provide a barrier to prevent these elements from reaching the metal. Additionally, alloying iron with elements like chromium creates stainless steel, which effectively resists rust.

67. (A) Copper and Zinc
Brass is a widely used metallic alloy known for its golden appearance and excellent acoustic properties. It is primarily created by combining copper with zinc in varying proportions. This combination enhances the strength and corrosion resistance of the material compared to pure copper. Brass is commonly used in the manufacture of musical instruments, decorative hardware, and various electrical components due to its versatility.

68. (A) Aqueous solution - A solution in which water is the solvent
Solutions are classified based on the nature of the solvent and the amount of solute dissolved. An aqueous solution is one where water serves as the dissolving medium. A saturated solution contains the maximum possible amount of solute at a given temperature, while an unsaturated solution can still dissolve more. Non-aqueous solutions use solvents other than water, such as alcohol or benzene.

69. (C) Chalk powder stirred in water
A suspension is a heterogeneous mixture containing large solid particles that do not dissolve but remain suspended throughout the liquid. Chalk powder stirred in water is a perfect example, as the white particles are visible and will eventually settle to the bottom if left undisturbed. This differs from true solutions, where particles are molecularly dispersed, and colloids, where particles are smaller and more stable.

70. (A) Both A and R are true and R is the correct explanation of A.
Catalysts play a critical role in the chemical industry by significantly improving production efficiency and speed. They function by providing an alternative reaction pathway with a lower activation energy, thereby increasing the rate of reaction. Importantly, a catalyst is not a reactant and remains chemically unchanged at the end of the process, allowing it to be reused multiple times in the same reaction.

71. (A) I, II, III and IV
Chemistry provides numerous solutions for daily needs, such as antacids for neutralizing stomach acid and detergents for effective cleaning in hard water. Organic dyes provide color to textiles, while preservatives like sodium benzoate ensure food safety and longevity. However, analgesics are specifically used for pain relief in medicine and are not involved in the preservation of fish or other food products.

72. (A) P-III, Q-I, R-II, S-IV
Safe laboratory practices require specific precautions for different chemical hazards. Concentrated acids should be handled with protective gloves and goggles to prevent skin burns. Volatile or toxic organic solvents must be used within a fume hood to avoid harmful inhalation. Flammable liquids are kept away from heat sources to prevent fires, and volatile bases require care to avoid breathing in corrosive vapors.

Click Here to Buy book on Amazon

is neutral at seven, followed by human blood which is slightly alkaline at approximately 7.4. Sodium hydroxide solution is a very strong base and therefore has the highest pH value in this sequence, approaching the upper end of the scale.

128. (D) Hyperacidity - Magnesium hydroxide remedy
Neutralisation reactions provide effective remedies for various chemical conditions. Hyperacidity in the stomach is safely treated using magnesium hydroxide, a mild base that neutralizes excess hydrochloric acid. Other treatments include using baking soda for acidic ant stings and vinegar for alkaline wasp stings. Acidic soil is typically balanced using basic lime rather than ammonium nitrate, which can actually increase soil acidity.

129. (C) Ammonium chloride is a salt from strong acid/weak base.
The nature of a salt solution depends on the relative strengths of the acid and base from which it was formed. Ammonium chloride is an acidic salt because it originates from the reaction between a strong acid, hydrochloric acid, and a weak base, ammonium hydroxide. Consequently, its aqueous solution will be slightly acidic. Other salts, like sodium acetate, are basic in nature.

130. (A) Both A and R are true and R is the correct explanation of A.
Calcium carbonate is an exceptionally important compound in the construction industry. It occurs naturally in several forms, including limestone, marble, and chalk. These materials are essential raw resources for the manufacturing of cement and lime. Due to its abundance and chemical properties, calcium carbonate serves as a fundamental building block for modern infrastructure and various architectural and decorative materials worldwide.

131. (A) I, II, III and IV
Baking soda is pure sodium bicarbonate, while baking powder is a mixture that includes a mild edible acid. When used alone in baking, sodium bicarbonate can produce sodium carbonate, which often imparts an undesirable bitter taste to the final product. The acid in baking powder neutralizes this bitterness, making it a more versatile ingredient for producing light and tasty baked goods.

132. (A) P-I, Q-II, R-III, S-IV
Water hardness is categorized by the specific minerals dissolved in it. Temporary hardness is caused by calcium or magnesium bicarbonates and can be removed by boiling. Permanent hardness, which is more difficult to remove, is caused by the chlorides and sulphates of these same metals. Understanding these chemical differences is crucial for selecting the appropriate treatment method for softening water supplies.

133. (C) It bleaches by oxidation through nascent oxygen release.
The bleaching action of bleaching powder is fundamentally a chemical oxidation process. In the presence of moisture or dilute acids, the compound releases nascent oxygen, which is highly reactive. This oxygen reacts with colored organic matter, breaking down the pigments and rendering them colorless. This oxidative mechanism makes bleaching powder an effective agent for whitening textiles and disinfecting water in various applications.

134. (A) Mine gypsum → Grind to powder → Heat strictly to 373 K → Store in moisture-proof container
Preparing Plaster of Paris requires careful temperature control during the dehydration of gypsum. Gypsum is mined and ground before being heated to exactly three hundred seventy-three Kelvin. At this temperature, it loses a specific amount of water to become the hemihydrate. It must then be stored in moisture-proof containers to prevent it from absorbing water and reverting back to solid gypsum.

135. (D) Colour change upon heating is an irreversible chemical change.
Hydrated copper sulphate contains water of crystallisation that gives it a beautiful blue color. When heated, this water is lost, and the crystals turn into a white anhydrous powder. Importantly, this process is a reversible physical and chemical change. If water is added back to the white powder, the salt will rehydrate, and its original blue color will be immediately restored.

136. (B) Temporary hardness - Caused by calcium sulphate
It is vital to correctly match the type of water hardness with its chemical cause. Temporary

Downloaded from www.pdf.tube

(B) Steam distillation
(C) Destructive distillation
(D) Vacuum filtration
(E) Answer not known

7. Which of the following pairs regarding petroleum fractions and their uses is incorrectly matched?
(A) LPG - Domestic cooking fuel
(B) Kerosene - Aviation turbine fuel
(C) Asphalt - Road surfacing
(D) Diesel - Lubricating heavy machinery
(E) Answer not known

8. Consider the following petroleum fractions:
I. Petrol
II. Diesel
III. LPG
IV. Lubricating oil
Which of the following represents the correct sequence in the increasing order of their boiling points?
(A) III, I, II, IV
(B) I, III, II, IV
(C) III, II, I, IV
(D) I, II, III, IV
(E) Answer not known

9. Which of the following statements about Liquefied Petroleum Gas (LPG) is correct?
(A) It consists mainly of methane and ethane.
(B) It has a distinct natural odor that helps in detecting leaks.
(C) It is stored as a liquid under high pressure in cylinders.
(D) It produces more smoke compared to burning wood or coal.
(E) Answer not known

10. Match the items in List I with the items in List II.
List I: (Fuel Gas)
P. CNG
Q. LPG
R. Biogas
S. Water Gas
List II: (Primary Component)
I. Methane
II. Butane and Propane
III. Methane and Carbon dioxide
IV. Carbon monoxide and Hydrogen
Which of the following is the correct matching?
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-I, Q-III, R-II, S-IV
(D) P-III, Q-IV, R-I, S-II
(E) Answer not known

11. Consider the following statements regarding petrol and diesel:
I. Petrol consists of lighter hydrocarbons compared to diesel.
II. Octane number is used to measure the ignition quality of petrol.
III. Cetane number is used to measure the ignition delay of diesel.
IV. Diesel engines use spark plugs for ignition.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I and III only
(D) II and IV only
(E) Answer not known

NODIA

12. Which of the following statements regarding Octane and Cetane numbers is incorrect?
(A) Higher octane number indicates better anti-knock properties in petrol.
(B) Iso-octane has an octane number of 0.
(C) Higher cetane number indicates quicker ignition of diesel.
(D) Heptane has an octane number of 0.
(E) Answer not known

13. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Kerosene was widely used as an illuminant and cooking fuel in rural India.
Reason (R): It has a higher volatility than petrol, making it safer for domestic storage.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

would otherwise occur much too slowly. Each enzyme is highly specific to a particular reaction, ensuring that biological processes are carried out efficiently and accurately within the cell.

146. (A) I, II, III and IV
Food preservation techniques rely on various chemical principles to prevent spoilage. Salt and sugar use osmosis to reduce moisture levels, inhibiting bacterial growth. Vinegar creates an acidic environment that is hostile to most microbes. In modern packaging, nitrogen gas is used to replace oxygen, which prevents the oxidation and rancidity of fats and oils, keeping snacks fresh and crisp for much longer.

147. (A) Cover with baking soda → Wait for bubbling to stop → Wait for bubbling to stop → Wipe with a damp cloth
Safely managing an acid spill in the laboratory requires a controlled neutralization process. Applying a mild base like baking soda reacts with the acid to produce carbon dioxide, visible as bubbling. Once the bubbling stops, it indicates that the acid has been fully neutralized. The resulting harmless salt and water can then be safely wiped away with a damp cloth for disposal.

148. (A) Atom Economy - Maximizing use of all starting materials.
Atom economy is a core principle of green chemistry that measures the efficiency of a chemical reaction. It encourages chemists to design synthetic routes where the maximum number of atoms from the starting materials are incorporated into the final desired product. This approach reduces waste and the consumption of resources, leading to more sustainable and cost-effective industrial and laboratory chemical processes.

149. (C) Saponification
Saponification is the specific chemical process used to manufacture soap. It involves the alkaline hydrolysis of fats or oils, which are chemically esters of fatty acids and glycerol. When these fats are heated with a strong base like sodium hydroxide, they break down to produce soap and glycerol. This reaction has been used for centuries and remains the fundamental basis of modern soap production.

150. (A) Both A and R are true and R is the correct explanation of A.
Metals that are positioned above hydrogen in the reactivity series can displace hydrogen from dilute acids. When zinc granules are added to dilute sulphuric acid, a displacement reaction occurs, producing zinc sulphate and liberating hydrogen gas. The identity of this gas is confirmed by the characteristic "pop" sound it makes when a burning splint is introduced, indicating a rapid combustion reaction.

151. (A) I, II, IV and V
Compounds and mixtures are distinguished by several key characteristics. Compounds have fixed compositions and are formed with significant energy changes, resulting in new properties. Mixtures retain the properties of their original components and lack sharp melting points. Crucially, while mixtures are easily separated by physical means, the elements in a compound are chemically bonded and can only be separated through chemical reactions.

152. (A) P-I, Q-II, R-III, S-IV
The discovery of subatomic particles was a milestone in atomic physics. J.J. Thomson identified the electron, while Ernest Rutherford and Eugen Goldstein contributed to the discovery of the proton. James Chadwick later discovered the neutral neutron. Rutherford is also famously credited with discovering the dense atomic nucleus through his gold foil experiment, which fundamentally changed our understanding of the internal structure of the atom.

153. (C) It generally increases across a period and decreases down a group.
Electronegativity is a measure of an atom's ability to attract shared electrons within a chemical bond. This property generally increases as you move from left to right across a period due to the increasing nuclear charge. Conversely, electronegativity decreases down a group because the increasing distance between the nucleus and the valence electrons reduces the nucleus's effective pull on those electrons.

154. (A) Potassium → Zinc → Iron → Copper
The reactivity series is an arrangement of metals in descending order of their chemical reactivity. Potassium is an extremely reactive alkali

Click Here to Buy book on Amazon

39. Thermoplastics and thermosetting plastics are classified based on their:
(A) Origin
(B) Electrical conductivity
(C) Optical transparency
(D) Response to heat
(E) Answer not known

40. Which of the following is the most appropriate reason for the growing use of biodegradable plastics?
(A) Possess much higher tensile strength than standard synthetic polymers.
(B) Decompose into harmless substances by natural microbial action.
(C) Are significantly more cost-effective to produce than crude oil plastics.
(D) Maintain higher thermal melting points required for heavy industry.
(E) Answer not known

41. In agriculture, fertilizers are defined as:
(A) Biological agents applied to fields to eradicate specialized pests.
(B) Chemicals used on industrial crops to accelerate seed germination.
(C) Substances added to soil to provide primary essential nutrients.
(D) Hormones injected into the vascular system to increase plant height.
(E) Answer not known

42. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Nitrogen fertilizers are essential for promoting vegetative growth in plants.
Reason (R): Nitrogen is a major constituent of chlorophyll, amino acids, and proteins in plants.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

43. Match the items in List I with the items in List II.
List I: (Plant Nutrient)
P. Nitrogen
Q. Phosphorus
R. Potassium
S. Calcium
List II: (Primary Role)
I. Root development and energy transfer
II. Vegetative growth and green color
III. Cell wall structure
IV. Disease resistance and stomatal regulation
Which of the following is the correct matching?
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-II, S-IV
(E) Answer not known

44. Which of the following is classified as a micronutrient for plants?
(A) Magnesium
(B) Zinc
(C) Sulfur
(D) Potassium
(E) Answer not known

45. Consider the following statements regarding plant deficiency symptoms:
I. Nitrogen deficiency leads to yellowing of older leaves.
II. Phosphorus deficiency causes stunted growth and dark green leaves.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I only
(C) II only
(D) Neither I nor II
(E) Answer not known

46. Which microorganism is primarily responsible for converting atmospheric nitrogen into ammonia during symbiotic nitrogen fixation?
(A) Rhizobium
(B) Nitrobacter
(C) Nitrosomonas
(D) Denitrifying bacteria
(E) Answer not known

47. Which of the following pairs of the nitrogen cycle is correctly matched?
(A) Ammonification - Conversion of ammonia to nitrate
(B) Denitrification - Conversion of atmospheric

NODIA

CHAPTER 07

Applied Chemistry: Petroleum, Fertilizers and Pesticides

1. Which of the following best defines a fossil fuel in the context of energy resources?
(A) Fuels derived from modern biological systems like recently harvested plant biomass
(B) Synthetic fuels manufactured through complex chemical processing of various inorganic minerals
(C) Fuels from fossilized organic remains decomposed over millions of years
(D) Energy sources obtained from natural renewable flows like solar and wind power
(E) Answer not known

2. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Anthracite is considered the highest quality of coal.
Reason (R): Anthracite has the highest carbon content and lowest moisture content among all coal types.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

3. Match the items in List I with the items in List II.
List I: (Coal Type)
P. Peat
Q. Lignite
R. Bituminous
S. Anthracite
List II: (Carbon Content Range)
I. 86-97%
II. 45-86%
III. 25-35%
IV. Less than 20%
Which of the following is the correct matching?
(A) P-IV, Q-III, R-II, S-I
(B) P-III, Q-IV, R-I, S-II
(C) P-IV, Q-II, R-III, S-I
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

4. What is the primary geological origin of crude petroleum?
(A) Decomposition of marine microbes buried under layers of sedimentary rocks
(B) Metamorphism of continental terrestrial rocks under conditions of extreme heat
(C) Solidification of molten volcanic magma deep within the terrestrial Earth's crust
(D) Chemical reaction involving atmospheric carbon dioxide and alkaline ocean water
(E) Answer not known

5. Consider the following statements regarding the composition of crude petroleum:
I. It primarily consists of hydrocarbons such as alkanes, cycloalkanes, and aromatic hydrocarbons.
II. It contains minor amounts of nitrogen, oxygen, and sulfur compounds.
III. It is a pure homogeneous mixture of only liquid hydrocarbons.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I only
(D) III only
(E) Answer not known

6. Which process is primarily used in oil refineries to separate crude oil into useful fractions like petrol, diesel, and kerosene?
(A) Fractional distillation

Downloaded from www.pdf.tube

metal at the top of the series. Zinc and iron are moderately reactive, while copper is a relatively unreactive metal located much lower down. This order is essential for predicting the outcomes of displacement reactions and the stability of various metal compounds.

155. (A) They are usually good conductors of electricity in the solid state.
Covalent compounds are formed by the sharing of electrons between non-metal atoms, creating neutral molecules. Because they lack free-moving ions or electrons, they are generally poor conductors of electricity in any state. These compounds also tend to have lower melting and boiling points compared to ionic substances and are often more soluble in organic solvents than in polar solvents like water.

156. (B) Phosphate radical (PO_4) - Valency 1
Radicals are groups of atoms that behave as a single unit during chemical reactions and possess a specific valency. Sulphate and carbonate radicals both have a valency of two, while the nitrate radical has a valency of one. The phosphate radical, however, is trivalent, meaning it has a valency of three. Knowing the correct valency of these radicals is essential for writing chemical formulas.

157. (B) Adding the valencies together to find the subscript for the final compound.
The cross-over or criss-cross method is a simple rule for determining chemical formulas. It involves writing the symbols of elements and their valencies, then swapping the valency numbers to serve as subscripts for the opposite symbol. This method ensures that the total positive and negative charges in the compound are balanced. It never involves adding the valency values together to create subscripts.

158. (A) Mixing reagents in a sealed tube and weighing.
To verify the Law of Conservation of Mass, it is essential to conduct the reaction in a closed system to prevent any loss of matter. Mixing reagents in a sealed tube ensures that no gaseous products or reactants can escape to or enter from the environment. By weighing the tube before and after the reaction, scientists can confirm that the total mass remains unchanged.

NODIA

159. (C) It is a double displacement precipitation reaction.
When aqueous solutions of silver nitrate and sodium chloride are combined, a double displacement reaction occurs where the ions exchange partners. This results in the formation of sodium nitrate and silver chloride. Silver chloride is insoluble in water, which causes it to emerge from the solution as a visible white precipitate. Such reactions are commonly used in analytical chemistry to detect specific ions.

160. (D) Oxidation
In chemical terms, oxidation is defined as the process where an atom or ion loses one or more electrons. When a ferrous ion, which has a positive charge of two, is converted into a ferric ion with a positive charge of three, it must lose one electron. This increase in positive charge directly identifies the process as oxidation, which is a fundamental component of redox reactions.

www.nodia.in

14. Which of the following represents the correct sequence of hydrocarbon chain length from shortest to longest?
(A) Petrol → LPG → Kerosene → Diesel
(B) LPG → Petrol → Kerosene → Diesel
(C) Petrol → Kerosene → LPG → Diesel
(D) LPG → Kerosene → Petrol → Diesel
(E) Answer not known

15. The phenomenon of "knocking" in internal combustion engines is primarily caused by:
(A) Presence of water vapor in the fuel
(B) Complete combustion of the fuel
(C) Premature ignition of the air-fuel mixture
(D) High cetane number in petrol engines
(E) Answer not known

16. Which of the following pairs of fuel additives and their purpose is correctly matched?
(A) Ethyl mercaptan - Increasing calorific value
(B) Ethanol - Reducing octane number
(C) Sulfur - Enhancing engine lubrication
(D) Tetraethyl lead - Anti-knocking agent
(E) Answer not known

17. Consider the following statements regarding petroleum refining:
I. Fractional distillation separates crude oil based on boiling points.
II. Cracking is the process of breaking large hydrocarbons into smaller ones.
III. Reforming improves the octane rating of petrol.
IV. Desulfurization removes sulfur to prevent sulfur dioxide emissions.
V. Vacuum distillation is used for lighter fractions to prevent evaporation.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV only
(B) II, III, IV and V only
(C) I, II, IV and V only
(D) I, III, IV and V only
(E) Answer not known

18. Which petroleum fraction is characterized by being non-volatile, highly viscous, and primarily used for road surfacing?
(A) Kerosene
(B) Asphalt
(C) Naphtha
(D) Paraffin wax
(E) Answer not known

19. Hydrocarbons containing only single bonds between carbon atoms are classified as:
(A) Alkenes
(B) Alkynes
(C) Aromatics
(D) Alkanes
(E) Answer not known

20. What is the most appropriate safety precaution when a strong smell of ethyl mercaptan is detected in a kitchen?
(A) Open windows and avoid using any electrical switches or devices.
(B) Immediately activate high-speed ventilation or electric exhaust fans.
(C) Light a match or lighter to safely burn off the leaked gas.
(D) Pour cold water over the main body of the LPG cylinder.
(E) Answer not known

21. Petrochemicals are best defined as:
(A) Chemicals extracted exclusively from rocks and minerals
(B) Synthetic elements created in nuclear reactors
(C) Chemical products derived from petroleum and natural gas
(D) Bio-based chemicals derived from plant matter
(E) Answer not known

22. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Thermosetting plastics cannot be reshaped upon heating.
Reason (R): During molding, they form strong cross-linked covalent bonds between polymer chains.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

Click Here to Buy book on Amazon

hardness is exclusively caused by the presence of dissolved bicarbonates of calcium and magnesium. Calcium sulphate, on the other hand, is a major contributor to permanent hardness. While temporary hardness can be removed by boiling, permanent hardness requires chemical interventions such as treatment with washing soda.

137. (C) Natural turmeric extract
Chemical indicators are classified as synthetic or natural based on their origin. Phenolphthalein and methyl orange are common synthetic indicators manufactured in laboratories for precise pH measurements. In contrast, turmeric is a natural substance that acts as an indicator by changing color in basic environments. While useful, natural indicators are often less precise than their synthetic counterparts in professional laboratory settings.

138. (D) Substances that completely dissociate into ions in water.
A strong electrolyte is a substance that dissolves in water and dissociates completely into its constituent ions. This total ionization allows the solution to conduct electricity very efficiently. Common examples include strong acids, strong bases, and most soluble salts. This behavior is distinct from weak electrolytes, which only partially ionize, and non-electrolytes, which do not produce any ions when they are dissolved.

139. (A) A pure silver plate
During the process of electroplating, the object to be coated is placed at the cathode, while the metal used for the coating serves as the anode. To plate a copper object with silver, a pure silver plate must be used as the anode. This setup allows silver ions to dissolve into the electrolyte and then deposit onto the copper object at the cathode.

140. (B) Barrier protection and Sacrificial protection
Galvanisation provides dual protection against the corrosion of iron. First, the zinc layer acts as a physical barrier that prevents oxygen and moisture from reaching the underlying iron. Second, it offers sacrificial protection because zinc is more reactive than iron. If the coating is scratched, the zinc will corrode in preference to the iron, ensuring the structural integrity of the object.

141. (A) I and II
Rusting is a slow chemical reaction where iron combines with environmental oxygen and water to form hydrated iron(III) oxide. This process is technically exothermic, as it releases a small amount of heat energy, though this is rarely noticeable due to its slow pace. The chemical formula for rust is $Fe_2O_3 \cdot xH_2O$, reflecting its hydrated nature. Preventing this reaction is vital for maintaining metal structures.

NODIA

142. (A) Alloy of lead and tin with a low melting point.
Solder is a specialized metallic alloy used extensively in the electronics and plumbing industries for joining components together. It is primarily composed of a mixture of lead and tin. The most important characteristic of solder is its relatively low melting point, which allows it to melt and flow easily when heat is applied, creating a strong and conductive electrical or mechanical joint.

143. (A) Both A and R are true and R is the correct explanation of A.
The lack of light scattering in true solutions is directly related to the extremely small size of the solute particles. These particles are typically less than one nanometer in diameter, which is much smaller than the wavelength of visible light. Because the particles are so minute, they cannot deflect light rays, allowing a beam of light to pass through the solution without being seen.

144. (A) P-I, Q-II, R-III, S-IV
Different types of mixtures interact with light in unique ways based on their particle size. Salt in water forms a true solution that does not scatter light. Milk in water is a colloid that exhibits the Tyndall effect. Chalk powder in water forms a suspension where large particles eventually settle. Smoke in air is a solid aerosol colloid that also clearly displays light scattering.

145. (C) Enzymes
Enzymes are specialized, complex organic molecules that serve as biological catalysts in all living organisms. They are essential for life as they significantly accelerate vital chemical reactions, such as digestion and metabolism, that

31. Consider the following statements regarding detergents and soaps:
I. Soaps are sodium or potassium salts of long-chain fatty acids.
II. Detergents are sodium salts of long-chain alkyl benzene sulphonic acids.
III. Soaps form scum in hard water.
IV. Detergents lose their cleansing action in hard water.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I and III only
(D) I, II and IV only
(E) Answer not known

32. Which of the following statements about saponification is incorrect?
(A) It involves the hydrolysis of esters under alkaline conditions.
(B) Glycerol is produced as a by-product.
(C) Vegetable oils or animal fats are used as raw materials.
(D) It is used exclusively for the production of synthetic detergents.
(E) Answer not known

33. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Synthetic detergents are more effective than soaps in hard water.
Reason (R): Calcium and magnesium salts of detergents are soluble in water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

34. Consider the following stages of micelle formation during the cleansing action of soap:
I. Dirt attachment
II. Micelle formation
III. Hydrocarbon tail dissolves
IV. Ionic head dissolves in water
Which of the following represents the correct sequence of micelle formation?
(A) I → II → III → Wash away
(B) III in dirt → II → IV → Wash away
(C) IV in dirt → III in water → II → Wash away
(D) II → IV in dirt → III in water → Wash away
(E) Answer not known

35. The fundamental chemical basis of a dye's ability to impart color is due to the presence of:
(A) Alkyl groups
(B) Isomers
(C) Hydroxyl groups
(D) Chromophores
(E) Answer not known

NODIA

36. Which of the following pairs of dye classifications is incorrectly matched?
(A) Basic dyes - Primarily used for cotton without a mordant
(B) Azo dyes - Contain -N=N- group
(C) Vat dyes - Applied in soluble form and oxidized to insoluble form
(D) Disperse dyes - Used for synthetic fibres like polyester
(E) Answer not known

37. Consider the following statements about explosives:
I. Explosives undergo rapid decomposition releasing large volumes of gases.
II. Dynamite contains nitroglycerin as its primary explosive ingredient.
III. TNT is an abbreviation for Trinitrotoluene.
IV. RDX is a powerful military explosive.
V. Controlled explosives are prohibited in the mining industry.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV only
(B) II, III, IV and V only
(C) I, III, IV and V only
(D) I, II, IV and V only
(E) Answer not known

38. A key feature of an explosive chemical reaction is that it must be:
(A) Highly exothermic and rapid
(B) Highly endothermic
(C) Slow and sustained
(D) Dependent on external oxygen supply for expansion
(E) Answer not known

23. Match the items in List I with the items in List II.
List I: (Synthetic Fibre)
P. Nylon
Q. Polyester
R. Rayon
S. Acrylic
List II: (Characteristic/Use)
I. Artificial silk
II. Substitute for wool
III. Wrinkle-resistant clothing
IV. Parachutes and ropes
Which of the following is the correct matching?
(A) P-IV, Q-III, R-I, S-II
(B) P-III, Q-IV, R-II, S-I
(C) P-IV, Q-I, R-III, S-II
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

24. Which of the following is a characteristic property of Nylon?
(A) High water absorption capacity
(B) High tensile strength and elasticity
(C) Poor resistance to abrasion
(D) Highly prone to fungal attacks
(E) Answer not known

25. Consider the following statements about Rayon:
I. It is a completely synthetic fibre made from petrochemicals.
II. It is obtained by the chemical treatment of wood pulp.
Which of the above statement(s) is/are incorrect?
(A) I and II only
(B) II only
(C) I only
(D) Neither I nor II
(E) Answer not known

26. Which of the following is an example of a synthetic rubber?
(A) Polyisoprene
(B) Cellulose
(C) Bakelite
(D) Neoprene
(E) Answer not known

27. Which of the following pairs concerning the vulcanization of rubber is correctly matched?
(A) Additive used - Sulfur
(B) Vulcanizing agent - Sodium
(C) Purpose - Increasing stickiness
(D) Resulting property - Decreased elasticity
(E) Answer not known

28. Consider the following steps of addition polymerization:
I. Propagation
II. Termination
III. Initiation
IV. Monomer preparation
Which of the following represents the correct sequence?
(A) IV, III, I, II
(B) III, I, II, IV
(C) IV, I, III, II
(D) III, IV, I, II
(E) Answer not known

29. Which of the following statements correctly highlights the primary environmental concern regarding plastics?
(A) They decompose too rapidly, releasing methane.
(B) They are non-biodegradable and accumulate in ecosystems.
(C) They are highly biodegradable in marine environments.
(D) They deplete the ozone layer upon combustion.
(E) Answer not known

30. Match the items in List I with the items in List II.
List I: (Polymer)
P. Polyethylene
Q. PVC
R. Teflon
S. Polystyrene
List II: (Monomer)
I. Tetrafluoroethylene
II. Styrene
III. Ethene
IV. Vinyl chloride
Which of the following is the correct matching?
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-IV, R-III, S-II
(E) Answer not known

Downloaded from www.pdf.tube

nitrogen to ammonia
(C) Nitrification - Conversion of ammonia to nitrites and nitrates
(D) Nitrogen fixation - Conversion of nitrates back to atmospheric gas
(E) Answer not known

48. Consider the following processes of the nitrogen cycle:
I. Assimilation
II. Nitrogen Fixation
III. Nitrification
IV. Ammonification
Which of the following represents the correct sequential order starting from the atmosphere?
(A) II, III, I, IV
(B) II, IV, III, I
(C) I, II, III, IV
(D) III, I, IV, II
(E) Answer not known

49. Which of the following statements about Urea is correct?
(A) It is a phosphatic fertilizer.
(B) It is primarily mined from natural rock deposits.
(C) It contains about 46% nitrogen by weight.
(D) It increases the alkalinity of the soil significantly upon breakdown.
(E) Answer not known

50. Match the items in List I with the items in List II.
List I: (Fertilizer)
P. Superphosphate
Q. Ammonium sulphate
R. Muriate of potash
S. DAP
List II: (Classification)
I. Potassic fertilizer
II. Complex fertilizer
III. Phosphatic fertilizer
IV. Nitrogenous fertilizer
Which of the following is the correct matching?
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-I, R-IV, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

NODIA

51. Consider the following statements regarding Phosphatic fertilizers:
I. Superphosphate is manufactured by treating rock phosphate with sulfuric acid.
II. They promote early root formation and growth.
III. Diammonium phosphate (DAP) provides only phosphorus.
IV. Phosphorus is highly mobile in soil and leaches easily.
Which of the above statement(s) is/are incorrect?
(A) I and II only
(B) III and IV only
(C) II and III only
(D) I and IV only
(E) Answer not known

52. Which of the following statements regarding potassic fertilizers is incorrect?
(A) Used primarily to promote early flowering.
(B) Muriate of potash which is chemically identified as potassium chloride.
(C) Sulphate of potash which is suitable for crops sensitive to chloride ions.
(D) Potassium which improves overall crop quality and abiotic stress tolerance.
(E) Answer not known

53. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): NPK fertilizers are known as complex fertilizers.
Reason (R): They provide two or more primary macronutrients simultaneously in a single application.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

54. Which of the following sequences represents the correct order of Nitrogen, Phosphorus, and Potassium percentages in standard agricultural notation?
(A) P-N-K
(B) K-P-N

sequence?
(A) I, II, III, IV
(B) IV, II, I, III
(C) III, IV, II, I
(D) II, I, IV, III
(E) Answer not known

115. Pheromone traps function primarily by:
(A) Emitting loud ultrasonic sounds to scare pests away from the crops.
(B) Releasing lethal doses of organophosphates into the local atmosphere.
(C) Attracting pests using bright fluorescent lights during the night hours.
(D) Emitting synthetic chemical attractants to lure and trap insects.
(E) Answer not known

116. Which of the following pairs is incorrectly matched?
(A) Weed - A beneficial plant that repels insects
(B) Parasitoid - Develops inside or on a host, eventually killing it
(C) Predator - Consumes multiple prey organisms during its lifetime
(D) Pathogen - A disease-causing microorganism used for pest control
(E) Answer not known

117. Consider the following statements regarding the harmful effects of pesticides on human health:
I. Acute toxicity can cause nausea, dizziness, and respiratory distress.
II. Chronic exposure has been linked to neurological disorders and cancers.
III. Endocrine disruptors can interfere with hormonal systems.
IV. Organophosphates are generally safer than botanical extracts.
V. Farm workers face higher occupational hazards if PPE is not used.
Which of the above statement(s) is/are correct?
(A) I, II, III and V only
(B) II, III, IV and V only
(C) I, III, IV and V only
(D) I, II, III and IV only
(E) Answer not known

118. Which highly toxic organochlorine pesticide was banned globally and specifically faced severe legal action in India following a public health disaster in Kasargod, Kerala?
(A) Endosulfan
(B) Cypermethrin
(C) Glyphosate
(D) Imidacloprid
(E) Answer not known

119. Botanical pesticides are derived from:
(A) Chemically synthesized petroleum by-products
(B) Heavy metals like arsenic and lead
(C) Genetically modified bacteria
(D) Extracts of plants having insecticidal properties
(E) Answer not known

120. In the context of agrochemicals and food safety, what is the most appropriate action if a food batch exceeds FSSAI permissible limits for pesticide residues?
(A) Selling it exclusively in rural markets
(B) Recall and safe destruction or rejection of the batch
(C) Re-labeling it as organic
(D) Diluting it with fresh produce and reselling
(E) Answer not known

121. Biofuels are defined as:
(A) Fossilized remains of ancient plants extracted from deep coal mines
(B) Nuclear fuels derived from uranium deposits
(C) Fuels derived directly from recently living biological matter or biomass
(D) Synthetic fuels created by splitting water molecules
(E) Answer not known

122. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The blending of ethanol with petrol is actively promoted by the Government of India.
Reason (R): It reduces the import dependency on crude oil and lowers greenhouse gas emissions.
(A) Both A and R are true and R is the correct explanation of A.

Click Here to Buy book on Amazon

(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

63. Match the items in List I with the items in List II.
List I: (Organic Input)
P. Vermicompost
Q. Green manure
R. Farmyard manure
S. Bio-fertilizer
List II: (Description)
I. Decomposition of organic waste by earthworms
II. Decomposed mixture of dung, urine, and litter
III. Live microbial inoculants
IV. Uprooted and incorporated leguminous crops
Which of the following is the correct matching?
(A) P-I, Q-IV, R-II, S-III
(B) P-II, Q-III, R-I, S-IV
(C) P-I, Q-II, R-III, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

64. Vermicompost is primarily rich in which of the following due to earthworm casting?
(A) Heavy metals and toxins
(B) Synthetic urea and phosphates
(C) Non-biodegradable plastics
(D) Humus, enzymes, and beneficial microbes
(E) Answer not known

65. Consider the following statements about Green Manure:
I. It improves soil structure and water holding capacity.
II. Leguminous green manure crops add atmospheric nitrogen to the soil.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I only
(C) II only
(D) Neither I nor II
(E) Answer not known

66. Which of the following organisms is a free-living nitrogen-fixing bio-fertilizer?
(A) Rhizobium
(B) Azotobacter
(C) Mycorrhiza
(D) Trichoderma
(E) Answer not known

67. Which of the following pairs is correctly matched regarding bio-fertilizers?
(A) Rhizobium - Cereal crops
(B) Blue-green algae - Arid desert soil
(C) Mycorrhiza - Nitrogen fixation only
(D) Azolla - Rice fields
(E) Answer not known

68. Consider the following steps of vermicomposting:
I. Release of earthworms into the pit
II. Harvesting of compost
III. Selection of shaded site and preparation of pit
IV. Addition of organic waste and cow dung
Which of the following represents the correct sequential order?
(A) III, IV, I, II
(B) IV, III, II, I
(C) I, III, IV, II
(D) III, I, IV, II
(E) Answer not known

69. Which of the following statements regarding Blue-green algae (Cyanobacteria) is correct?
(A) Acts as a pathogenic agent specifically targeting Indian paddy crops.
(B) Consumes all available nitrogen from the soil, depleting it completely.
(C) Fixing atmospheric nitrogen primarily in waterlogged rice paddy environments.
(D) Requires high doses of chemical pesticides to function properly in soil.
(E) Answer not known

NODIA

70. Match the items in List I with the items in List II.
List I: (Bio-fertilizer)
P. Rhizobium
Q. Azospirillum
R. Blue-green algae
S. Mycorrhiza
List II: (Target Crop / Environment)
I. Sugarcane and maize
II. Legumes (pulses)
III. Root systems for phosphorus uptake
IV. Paddy (flooded fields)
Which of the following is the correct matching?

(C) N-P-K
(D) N-K-P
(E) Answer not known

55. The concept of a balanced NPK ratio in agriculture implies:
(A) Applying equal weights of nitrogen, phosphorus, and potassium regardless of soil.
(B) Eliminating organic manure usage to prioritize maximum chemical crop yields.
(C) Using exclusively nitrogenous fertilizers during all developmental growth stages.
(D) Supplying nutrients in proportions matching crop and soil needs.
(E) Answer not known

56. Which of the following pairs is incorrectly matched regarding fertilizer composition?
(A) Urea - Amide nitrogen
(B) Muriate of Potash - Potassium sulfate
(C) Single Superphosphate - Water-soluble phosphorus
(D) DAP - Nitrogen and Phosphorus
(E) Answer not known

57. Consider the following statements about Neem coated urea:
I. Neem oil acts as a nitrification inhibitor.
II. It slows down the release of nitrogen into the soil.
III. It reduces the leaching of nitrates into groundwater.
IV. It was mandated by the Government of India to prevent diversion of agricultural urea for industrial use.
V. It completely eliminates the need for phosphorus fertilizers.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV only
(B) II, III, IV and V only
(C) I, III, IV and V only
(D) I, II, IV and V only
(E) Answer not known

58. What is the primary feature of the Soil Health Card Scheme launched by the Government of India?
(A) Providing direct financial subsidies to farmers for purchasing high-quality seeds.
(B) Distributing free pesticide and herbicide samples to various marginal farmers.
(C) Mandating the adoption of organic farming practices across all Indian states.
(D) Supplying recommendations of nutrients and fertilizers required for individual farms.
(E) Answer not known

59. Fertilizers that supply only one primary plant nutrient (N, P, or K) are classified as:
(A) Straight fertilizers
(B) Complex fertilizers
(C) Mixed fertilizers
(D) Bio-fertilizers
(E) Answer not known

60. The most appropriate reason for implementing fertilizer subsidies in India is to:
(A) Encouraging the excessive and unscientific use of urea fertilizers.
(B) Making essential nutrients affordable to ensure national food security.
(C) Maximizing net profits for state-owned petrochemical industries.
(D) Promoting the global export of surplus chemical fertilizer stocks.
(E) Answer not known

61. Organic farming is best defined as an agricultural system that:
(A) System that uses synthetic fertilizers and modified organisms extensively.
(B) System relying on crop rotation and compost to maintain soil productivity.
(C) System focusing purely on cash crops while ignoring environmental impacts.
(D) System utilizing advanced hydroponics without the use of any soil media.
(E) Answer not known

62. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Excessive use of chemical fertilizers can degrade soil health over time.
Reason (R): It can lead to the destruction of beneficial soil microorganisms and alter soil pH.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.

Downloaded from www.pdf.tube

(E) Answer not known

78. Which of the following is a primary feature of the National Programme for Organic Production (NPOP) in India?
(A) Establishing standards and procedures for organic certification.
(B) Providing free chemical fertilizers to newly converted organic farmers.
(C) Promoting the global export of genetically modified and treated seeds.
(D) Mandating a minimum support price for all brands of synthetic pesticides.
(E) Answer not known

79. Manures that consist of concentrated plant and animal residues with a higher nutrient content than bulky organic manures are classified as:
(A) Bulky organic manures
(B) Complex chemical fertilizers
(C) Concentrated organic manures
(D) Inorganic salts
(E) Answer not known

80. The most appropriate rationale for adopting sustainable agriculture practices in Tamil Nadu is to:
(A) Exhaust groundwater resources rapidly for the growth of high-yield cash crops.
(B) Completely abandon all forms of traditional farming knowledge and practices.
(C) Maximize the total reliance on imported and expensive synthetic fertilizers.
(D) Ensure food security while preserving soil health and ecosystems.
(E) Answer not known

81. Pesticides are legally and functionally defined as:
(A) Chemicals used exclusively to promote plant growth and cellular development.
(B) Organic compounds used to enrich soil microflora and bacterial diversity.
(C) Substances intended for preventing, destroying, or mitigating any pest.
(D) Synthetic hormones used primarily for large-scale animal husbandry practices.
(E) Answer not known

82. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The use of pesticides is considered necessary in modern intensive agriculture.
Reason (R): Pests, weeds, and diseases can cause significant pre-harvest and post-harvest crop losses, threatening food security.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

83. Match the items in List I with the items in List II.
List I: (Pesticide Category)
P. Insecticides
Q. Herbicides
R. Fungicides
S. Rodenticides
List II: (Target Organism)
I. Weeds
II. Rats and mice
III. Fungal pathogens
IV. Insects
Which of the following is the correct matching?
(A) P-IV, Q-I, R-III, S-II
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-I, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

84. Which of the following statements about DDT (Dichlorodiphenyltrichloroethane) is factually correct?
(A) An organochlorine insecticide known for its environmental persistence.
(B) A highly biodegradable organic fertilizer used in commercial agriculture.
(C) Its usage has been actively promoted worldwide in recent decades by NGOs.
(D) An agent that targets specifically only fungal diseases in commodity crops.
(E) Answer not known

85. Consider the following statements regarding Malathion:
I. It is an organophosphate insecticide.

NODIA

(D) Applying post-harvest fungicides to prevent bacterial growth.
(E) Answer not known

101. Biological pest control is defined as:
(A) Using synthetic chemicals synthesized from various biological materials.
(B) The physical removal of pests using specialized mechanical traps and nets.
(C) Suppression of pest populations by living predators or pathogens.
(D) The genetic modification of humans to resist various pest-borne diseases.
(E) Answer not known

102. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Biological control is often preferred over chemical control in sustainable agriculture.
Reason (R): Biological control agents are self-perpetuating, environmentally safe, and target specific pests.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

103. Match the items in List I with the items in List II.
List I: (Biocontrol Agent)
P. Ladybird beetle
Q. Trichogramma
R. Bacillus thuringiensis (Bt)
S. Trichoderma viride
List II: (Type/Target)
I. Fungal antagonist against soil-borne diseases
II. Bacterial pathogen against caterpillars
III. Egg parasitoid wasp
IV. Predator of aphids
Which of the following is the correct matching?
(A) P-IV, Q-III, R-II, S-I
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-I, R-II, S-III
(D) P-III, Q-IV, R-I, S-II
(E) Answer not known

104. Integrated Pest Management (IPM) is best described as:
(A) The complete eradication of all insect species from a commercial farm.
(B) Strategy combining various tools to manage pests economically.
(C) The exclusive use of banned chemical pesticides for maximum crop yield.
(D) A policy advocating the abandonment of agriculture in highly infested areas.
(E) Answer not known

105. Consider the following components of Integrated Pest Management (IPM):
I. Crop rotation and sanitation (Cultural control)
II. Use of pheromone traps (Mechanical/ Behavioral control)
III. Indiscriminate calendar-based spraying of broad-spectrum pesticides
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I only
(D) III only
(E) Answer not known

106. In the context of IPM, the "Economic Threshold Level" (ETL) refers to:
(A) The minimum market price at which the crop can be sold to consumers.
(B) The maximum amount of subsidy provided for pesticides by governments.
(C) The total cost of chemical fertilizers used in a single growing season.
(D) Pest density at which control measures should be initiated.
(E) Answer not known

107. Which of the following pairs is correctly matched regarding pesticide regulation?
(A) Time interval between the last pesticide application and harvest.
(B) Maximum Residue Limit which refers to the lowest dose lethal to insects.
(C) Lethal Dose 50 which is the legal limit of pesticide in drinking water.
(D) Bioaccumulation which refers to the breakdown of pesticides by sunlight.

Click Here to Buy book on Amazon

(D) They are commonly used for pest control in storage bins and grain silos.
(E) Answer not known

93. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The use of broad-spectrum pesticides often leads to pest resurgence.
Reason (R): Broad-spectrum pesticides eliminate both the pests and their natural enemies (predators and parasites).
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

94. Consider the following steps in the preparation and application of a pesticide spray:
I. Reading the label
II. Mixing in a ventilated area
III. Spraying
IV. Disposing empty containers safely
Which of the following represents the correct sequence?
(A) I, II, III, IV
(B) III, I, II, IV
(C) II, III, I, IV
(D) IV, I, II, III
(E) Answer not known

95. The concept of half-life in the context of environmental pesticides refers to:
(A) The time required for the pesticide to kill half of the pest population
(B) The maximum permissible limit of the pesticide in food crops
(C) The time required for half of the applied pesticide to degrade into other chemicals
(D) The duration for which the pesticide remains effective in the spray tank
(E) Answer not known

96. Which of the following pairs is incorrectly matched regarding plant disease and control?
(A) Late blight of potato - Fungicides
(B) Root-knot nematodes - Nematicides
(C) Locust swarms - Insecticides
(D) Cotton bollworm - Herbicides
(E) Answer not known

97. Consider the following statements regarding the harmful effects of chemical pesticides:
I. They can cause groundwater contamination through leaching.
II. They contribute to the decline of pollinator populations like bees.
III. They result in the development of pesticide resistance in pest populations.
IV. They improve the structural stability of soil.
V. They lead to bioaccumulation in higher trophic levels.
Which of the above statement(s) is/are correct?
(A) I, II, III and V only
(B) II, III, IV and V only
(C) I, III, IV and V only
(D) I, II, III and IV only
(E) Answer not known

98. A key feature of biopesticides compared to synthetic chemical pesticides is that they:
(A) Have a very broad spectrum, killing all insect life in the field
(B) Are generally host-specific and decompose quickly in the environment
(C) Are highly persistent and remain in the soil for decades
(D) Always require heavy machinery for application
(E) Answer not known

99. Based on their chemical nature, pesticides like Malathion and Parathion are classified as:
(A) Organochlorines
(B) Carbamates
(C) Pyrethroids
(D) Organophosphates
(E) Answer not known

100. The most appropriate strategy to mitigate the risks of pesticide residues in vegetables before consumption is:
(A) Washing with water and mild salt or vinegar solutions.
(B) Boiling them in various heavy metal and chemical solutions.
(C) Storing them in direct sunlight for a week to trigger decay.

Downloaded from www.pdf.tube

(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-II, S-IV
(E) Answer not known

71. Consider the following statements regarding Eutrophication:
I. It is caused by the runoff of nitrogen and phosphorus from agricultural fields into water bodies.
II. It leads to excessive growth of algae (algal blooms).
III. It increases the dissolved oxygen levels in the water.
IV. It results in the death of aquatic life due to oxygen depletion.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) II, III and IV only
(C) I and III only
(D) I, II and III only
(E) Answer not known

72. Which of the following statements about the PM-PRANAM scheme is incorrect?
(A) It aims to promote the balanced use of chemical and alternative fertilizers.
(B) It mandates a complete ban on the production of synthetic urea by 2025.
(C) It incentivizes States and UTs to adopt natural farming practices.
(D) It seeks to reduce the subsidy burden on chemical fertilizers.
(E) Answer not known

73. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Continuous use of ammonium sulphate fertilizer can make the soil acidic.
Reason (R): Ammonium ions are taken up by plants and sulphate ions react with soil water to form dilute sulphuric acid.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

74. Which of the following sequences represents the correct order of increasing precision in fertilizer application methods?
(A) Fertigation → Band placement → Broadcasting
(B) Broadcasting → Band placement → Fertigation
(C) Band placement → Broadcasting → Fertigation
(D) Broadcasting → Fertigation → Band placement
(E) Answer not known

75. The key difference between symbiotic and free-living nitrogen-fixing bacteria is that:
(A) Symbiotic bacteria fix nitrogen with plants; free-living fix it independently.
(B) Symbiotic bacteria fix phosphorus, whereas free-living ones fix gaseous nitrogen.
(C) Free-living bacteria require the formation of root nodules to survive in soil.
(D) Symbiotic bacteria are harmful pathogens, while free-living ones are beneficial.
(E) Answer not known

76. Which of the following pairs concerning organic fertilizers is incorrectly matched?
(A) Compost - Decomposed plant and animal waste
(B) Farmyard manure - Exclusively chemical ash
(C) Green manure - Sunhemp and Dhaincha
(D) Vermicompost - Earthworm castings
(E) Answer not known

77. Consider the following statements about the benefits of organic farming:
I. It improves soil health and fertility.
II. It reduces the carbon footprint of agriculture.
III. It guarantees a much higher crop yield in the first year compared to chemical farming.
IV. It promotes biodiversity.
V. It minimizes water pollution from agrochemical runoff.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V only
(B) II, III, IV and V only
(C) I, III and V only
(D) I, II and IV only

NODIA

(E) Answer not known

108. Consider the following steps of implementing an IPM program:
I. Identification of the pest
II. Implementation of control tactics (e.g., biological, chemical)
III. Monitoring and assessing pest population
IV. Evaluating the effectiveness of the control measures
Which of the following represents the correct sequential order?
(A) I, III, II, IV
(B) III, I, II, IV
(C) I, II, III, IV
(D) II, I, III, IV
(E) Answer not known

109. Which of the following is considered a bio-pesticide?
(A) Malathion
(B) Neem oil (Azadirachtin)
(C) Glyphosate
(D) Carbofuran
(E) Answer not known

110. Match the items in List I with the items in List II.
List I: (Regulatory Aspect)
P. Setting food safety standards in India
Q. Registration of pesticides
R. Regulation of insecticides act
S. Global pesticide residue limits
List II: (Associated Body/Act)
I. Codex Alimentarius Commission
II. Insecticides Act, 1968
III. Central Insecticides Board and Registration Committee (CIBRC)
IV. FSSAI
Which of the following is the correct matching?
(A) P-IV, Q-III, R-II, S-I
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-II, R-III, S-I
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

111. Consider the following statements about pesticide residues in food:
I. MRL is the maximum concentration of a pesticide residue legally permitted in or on food.
II. Residues above the MRL pose immediate lethal toxicity to human adults.
III. Thorough washing and peeling can reduce certain surface pesticide residues.
IV. Food safety regulators conduct regular sampling to ensure compliance with MRLs.
Which of the above statement(s) is/are correct?
(A) I, III and IV only
(B) II, III and IV only
(C) I and III only
(D) I, II and IV only
(E) Answer not known

112. Which of the following statements about the Central Insecticides Board (CIB) is incorrect?
(A) It advises the government on matters related to the administration of the Insecticides Act.
(B) It specifies the uses and application methods of pesticides.
(C) It recommends the maximum proportion of pesticide formulations.
(D) It provides direct financial subsidies to pesticide manufacturing companies.
(E) Answer not known

113. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The registration of new pesticide molecules in India requires extensive data on toxicity and environmental impact.
Reason (R): Agrochemicals can have severe non-target effects and long-term consequences on human health and ecosystems.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

114. Consider the following stages in the regulatory approval of a new pesticide:
I. Laboratory efficacy testing
II. Field trials
III. Submission to CIBRC
IV. Commercial sale
Which of the following represents the correct

Click Here to Buy book on Amazon

II. It has low toxicity to mammals compared to other organophosphates.

Which of the above statement(s) is/are correct?
(A) I and II
(B) I only
(C) II only
(D) Neither I nor II
(E) Answer not known

86. The mode of action of organophosphate insecticides primarily involves the inhibition of which crucial enzyme in insects?
(A) Acetylcholinesterase
(B) Amylase
(C) Pepsin
(D) ATP synthase
(E) Answer not known

87. Which of the following pairs of herbicide types is correctly matched with its definition?
(A) Selective herbicide - Kills all plant species it comes in contact with
(B) Non-selective herbicide - Kills only specific target weeds without harming the crop
(C) Post-emergent herbicide - Applied directly to seeds before sowing
(D) Pre-emergent herbicide - Applied before the weed seeds germinate
(E) Answer not known

88. Consider the following organisms in a food chain:
I. Small fish
II. Phytoplankton
III. Fish-eating birds
IV. Zooplankton

Which of the following represents the correct sequence of biomagnification of a pesticide like DDT?
(A) II, IV, I, III
(B) IV, II, I, III
(C) II, I, IV, III
(D) III, I, IV, II
(E) Answer not known

89. Which of the following statements concerning herbicides is correct?
(A) They are completely harmless to non-target flora.
(B) Glyphosate is an example of a selective herbicide.
(C) 2,4-D is a common selective herbicide used to control broadleaf weeds.
(D) They are used to kill fungal spores on seeds.
(E) Answer not known

90. Match the items in List I with the items in List II.

List I: (Fungicide Type)
P. Protectant fungicide
Q. Eradicant fungicide
R. Systemic fungicide
S. Bordeaux mixture

List II: (Example/Action)
I. Kills the fungus after infection has occurred
II. Absorbed and translocated within the plant
III. Applied before infection to prevent fungal entry
IV. Mixture of copper sulphate and calcium hydroxide

Which of the following is the correct matching?
(A) P-III, Q-I, R-II, S-IV
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-II, R-I, S-IV
(D) P-II, Q-III, R-IV, S-I
(E) Answer not known

91. Consider the following statements about Rodenticides:
I. They are designed to kill rodents such as rats and mice.
II. Zinc phosphide is a commonly used rodenticide.
III. They are entirely non-toxic to domestic animals and birds.
IV. Anticoagulants are a class of rodenticides that prevent blood clotting.

Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) II, III and IV only
(C) I and III only
(D) I, II and III only
(E) Answer not known

92. Which of the following statements regarding fumigants is incorrect?
(A) They are chemical compounds that exist as gases at room temperature.
(B) They are specifically designed to be safe for human inhalation.
(C) Aluminum phosphide is a widely used fumigant.

NODIA

(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

123. Match the items in List I with the items in List II.
List I: (Biofuel Generation)
P. First Generation (1G)
Q. Second Generation (2G)
R. Third Generation (3G)
S. Fourth Generation (4G)
List II: (Source Material)
I. Non-food biomass (lignocellulosic materials)
II. Algae
III. Genetically engineered organisms for carbon capture
IV. Edible food crops (sugarcane, corn)
Which of the following is the correct matching?
(A) P-IV, Q-I, R-II, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-II, R-I, S-III
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

124. What is the target percentage of ethanol blending in petrol (E20) set by the Government of India to be achieved by 2025?
(A) 5%
(B) 20%
(C) 10%
(D) 50%
(E) Answer not known

125. Consider the following statements regarding Biodiesel production:
I. It is produced through a chemical process called transesterification.
II. Vegetable oils or animal fats react with an alcohol in the presence of a catalyst.
III. Glycerin is produced as a valuable by-product.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I, II and III
(C) II and III only
(D) I and III only
(E) Answer not known

126. Biogas primarily consists of which of the following greenhouse gases?
(A) Methane and Carbon dioxide
(B) Ethane and Oxygen
(C) Propane and Butane
(D) Nitrous oxide and Sulfur dioxide
(E) Answer not known

127. Which of the following pairs regarding biofuel feedstocks in India is incorrectly matched?
(A) Bioethanol - Sugarcane molasses
(B) Biodiesel - Jatropha seeds
(C) Bio-jet fuel - Pulses and cereals
(D) Biogas - Cow dung and agricultural waste
(E) Answer not known

128. Consider the following biological processes involved in a biogas plant:
I. Methanogenesis
II. Hydrolysis
III. Acidogenesis
IV. Acetogenesis
Which of the following represents the correct sequential order?
(A) II, III, IV, I
(B) I, II, III, IV
(C) II, IV, III, I
(D) III, II, I, IV
(E) Answer not known

129. Which of the following plant species is recognized as a non-edible oilseed crop highly suitable for biodiesel production in India?
(A) Wheat (Triticum aestivum)
(B) Cotton (Gossypium hirsutum)
(C) Jatropha (Jatropha curcas)
(D) Mustard (Brassica juncea)
(E) Answer not known

130. Match the items in List I with the items in List II.
List I: (Biofuel property)
P. Octane rating of Ethanol
Q. Calorific value of Biogas
R. Oxygen content in Biodiesel
S. Viscosity of Biodiesel
List II: (Description)
I. Reduces particulate emissions during combustion
II. Higher than standard petrol, preventing knocking

Downloaded from www.pdf.tube

links between the polymer chains, significantly improving the material's physical properties. It increases the rubber's elasticity, tensile strength, and durability while reducing its stickiness. The resulting material is more stable and less prone to deformation under varying temperature conditions and heavy usage.

28. (A) IV, III, I, II
Addition polymerization follows a specific sequence of chemical stages. First, the necessary monomer must be prepared. The process begins with initiation, where a reactive catalyst creates active sites. This is followed by propagation, where the chain rapidly grows as monomers add to the active end. Finally, termination occurs when the growth stops, resulting in the completed polymer chain structure for use.

29. (B) They are non-biodegradable and accumulate in ecosystems.
The primary environmental challenge with synthetic plastics is their non-biodegradable nature. Most plastics are designed to be extremely durable, meaning they do not break down through natural microbial processes. Consequently, plastic waste accumulates in landfills and oceans, persisting for hundreds of years. This accumulation disrupts ecosystems, harms wildlife, and leads to the widespread presence of microplastics in nature.

30. (A) P-III, Q-IV, R-I, S-II
Polymers are formed from repeating units called monomers. Polyethylene is synthesized from ethene molecules. Polyvinyl chloride is created from vinyl chloride monomers. Teflon, known for its non-stick properties, is produced from tetrafluoroethylene. Polystyrene, used in packaging and insulation, is formed through the polymerization of styrene. Each monomer determines the specific chemical and physical characteristics of the resulting plastic material.

31. (A) I, II and III only
Soaps are traditional cleaning agents made from natural fats and oils, but they react with minerals in hard water to form insoluble scum. In contrast, synthetic detergents are engineered from petroleum products to remain effective in hard water. They contain sulfonates that do not form precipitates with calcium or magnesium ions, ensuring superior cleaning power in various difficult washing conditions.

32. (D) It is used exclusively for the production of synthetic detergents.
Saponification is the chemical reaction used specifically to produce soap by reacting fats or oils with a strong base like sodium hydroxide. This process hydrolyzes the ester bonds in triglycerides, yielding soap and glycerol as a valuable by-product. Synthetic detergents are manufactured through different chemical pathways involving petroleum-derived alkylbenzenes and sulfuric acid, rather than through the traditional saponification of fats.

NODIA

33. (A) Both A and R are true and R is the correct explanation of A.
Synthetic detergents are specifically designed to overcome the limitations of soap in hard water. While soap forms an insoluble precipitate with calcium and magnesium ions, the corresponding salts formed by detergents are highly soluble. This allows detergents to maintain their cleansing action and lathering ability even in water with high mineral content, making them more versatile for modern cleaning.

34. (B) III in dirt → II → IV → Wash away
Soap molecules consist of a hydrophobic hydrocarbon tail and a hydrophilic ionic head. During cleaning, the tails dissolve into the greasy dirt while the heads remain in the water. This arrangement forms a spherical structure called a micelle. The dirt becomes trapped in the center of the micelle and is easily washed away as the outer heads pull it into the water.

35. (D) Chromophores
The ability of a dye to impart color depends on specific structural features within the molecule. Chromophores are groups of atoms containing conjugated double bonds that absorb certain wavelengths of visible light, reflecting the complementary color. Common chromophores include nitro, azo, and carbonyl groups. Additionally, auxochromes are often present to intensify the color and help the dye bond firmly to fabrics.

(A) I, II, III and IV only
(B) II, III, IV and V only
(C) I, II and IV only
(D) I, II, III and V only
(E) Answer not known

138. The process of producing bioethanol from sugarcane juice primarily involves:
(A) Fractional distillation
(B) Thermal cracking
(C) Saponification
(D) Anaerobic fermentation by yeast
(E) Answer not known

139. Biogas, bioethanol, and biodiesel are collectively classified under which energy category?
(A) Renewable biological energy
(B) Non-renewable conventional energy
(C) Geothermal energy
(D) Tidal energy
(E) Answer not known

140. The most appropriate reason for emphasizing Second Generation (2G) biofuels in the National Policy on Biofuels is to:
(A) Utilize surplus food grains directly for fuel production purposes.
(B) Avoid the food vs. fuel debate by using agricultural residues.
(C) Completely replace electric vehicles in the transportation sector.
(D) Decrease agricultural income for rural farmers across the country.
(E) Answer not known

141. In petroleum refining, the process of 'cracking' is defined as:
(A) The physical separation of crude oil based on density and mass.
(B) Chemical breakdown of large hydrocarbons into smaller molecules.
(C) The synthesis of long-chain polymers from simple molecular monomers.
(D) The removal of sulfur impurities using pressurized hydrogen gas.
(E) Answer not known

142. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.

Assertion (A): Coating urea with neem oil increases the nitrogen use efficiency of the crop.
Reason (R): Neem oil acts as a nitrification inhibitor, slowing down the conversion of urea into nitrates, reducing leaching losses.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

143. Match the items in List I with the items in List II.
List I: (Fertilizer Compound)
P. Ammonium Nitrate
Q. Triple Superphosphate
R. Potassium Sulphate
S. Urea
List II: (Dominant Nutrient Provided)
I. Phosphorus
II. Potassium
III. Nitrogen (Amide form)
IV. Nitrogen (Nitrate and Ammoniacal form)
Which of the following is the correct matching?
(A) P-IV, Q-I, R-II, S-III
(B) P-III, Q-II, R-I, S-IV
(C) P-I, Q-IV, R-III, S-II
(D) P-II, Q-III, R-IV, S-I
(E) Answer not known

144. Which environmental issue is most commonly associated with excessive pesticide runoff in agricultural zones like the Cauvery delta region?
(A) Depletion of the ozone layer
(B) Increase in soil salinity due to sodium salts
(C) Acid rain due to sulfur dioxide emissions
(D) Accumulation of toxic residues in surface water and aquatic ecosystems
(E) Answer not known

145. Consider the following statements regarding the Tamil Nadu Organic Farming Policy (2023):
I. It aims to ensure safe food and environmental sustainability.
II. It promotes the use of bio-fertilizers and bio-pesticides.
III. It completely bans the sale of all synthetic fertilizers in the state immediately.
Which of the above statement(s) is/are correct?

Click Here to Buy book on Amazon

nitrates into volatile ammonia gas, leading to nitrogen loss.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

www.nodia.in

NODIA

Answer the question by selecting the appropriate option.
Assertion (A): The unscientific application of DAP (Diammonium Phosphate) can lead to zinc deficiency in crops.
Reason (R): High levels of phosphorus in the soil can react with zinc to form insoluble zinc phosphate, making it unavailable to plants.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

154. Which of the following correctly represents the primary hierarchy of plastic waste management preferred by environmental rules?
(A) Reduce → Reuse → Recycle → Dispose
(B) Dispose → Recycle → Reuse → Reduce
(C) Recycle → Dispose → Reduce → Reuse
(D) Reuse → Dispose → Recycle → Reduce
(E) Answer not known

155. Which of the following concepts primarily differentiates a biodegradable polymer from a non-biodegradable polymer?
(A) Chemical bonds can be broken down by microbial enzymes.
(B) The presence of metallic bonds within the molecular polymer chain.
(C) Its relative solubility in strong industrial and laboratory acids.
(D) Its innate ability to conduct electricity in aqueous environments.
(E) Answer not known

156. Which of the following pairs is correctly matched regarding the environmental impact of cleansing agents?
(A) Branched-chain detergents - Highly biodegradable
(B) Soaps - 100% Biodegradable
(C) Straight-chain detergents - Causes severe persistent foaming in rivers
(D) Synthetic detergents - Derived purely from animal fats
(E) Answer not known

157. Consider the following statements about the safe handling and application of agrochemicals:
I. Personal Protective Equipment (PPE) such as gloves and masks must be worn.
II. Spraying should ideally be done against the direction of the wind.
III. Empty pesticide containers should be crushed and buried safely, not reused for domestic purposes.
IV. Agrochemicals should be stored away from food articles and children.
V. Leftover pesticide solutions can be safely disposed of in natural water streams.
Which of the above statement(s) is/are correct?
(A) I, III and IV only
(B) I, II, III and IV only
(C) II, IV and V only
(D) I, III, IV and V only
(E) Answer not known

158. A key feature of the bio-fertilizer production strategy in states like Tamil Nadu is the promotion of liquid bio-fertilizers over carrier-based (solid) ones because:
(A) Liquid fertilizers have longer shelf life and microbial survival.
(B) They contain hazardous chemicals that kill pests instantly in soil.
(C) They are solid blocks that are significantly easier to transport.
(D) They prevent the germination of all weed seeds in the field.
(E) Answer not known

159. Dyes that are applied to textiles from an alkaline medium and require a reducing agent to make them soluble before application are classified as:
(A) Direct dyes
(B) Reactive dyes
(C) Vat dyes
(D) Disperse dyes
(E) Answer not known

NODIA

160. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The prolonged use of nitrate fertilizers in highly alkaline soils is discouraged without proper soil amendment.
Reason (R): Alkaline soils rapidly convert

III. Requires transesterification to lower it for engine use
IV. Depends on methane concentration
Which of the following is the correct matching?
(A) P-II, Q-IV, R-I, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-II, S-I
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

131. Consider the following statements regarding the advantages of Biofuels:
I. They are renewable energy sources.
II. They have zero carbon emissions during combustion.
III. They promote rural employment through agricultural feedstocks.
IV. They are biodegradable and less toxic than fossil fuels.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I, II, III and IV
(D) I, III and IV only
(E) Answer not known

132. Which of the following statements comparing Biodiesel and Petrodiesel is incorrect?
(A) Biodiesel has a higher sulfur content than petrodiesel.
(B) Biodiesel has a higher flash point, making it safer to store.
(C) Biodiesel has better lubricating properties for engine parts.
(D) Biodiesel can be blended with petrodiesel in any proportion.
(E) Answer not known

133. The following question consists of two statements, Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Bio-CNG (Compressed Biogas) has properties similar to commercially available natural gas.
Reason (R): Bio-CNG is produced by removing carbon dioxide and hydrogen sulfide from biogas, yielding over 90% methane.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

134. Which of the following sequences represents the correct progression of ethanol blending targets in India?
(A) E5 → E10 → E20
(B) E20 → E10 → E5
(C) E10 → E5 → E20
(D) E5 → E20 → E10
(E) Answer not known

135. Biofuels are often considered "carbon neutral" conceptually because:
(A) They do not emit any carbon dioxide when burned in engines.
(B) They convert atmospheric carbon into solid graphite during combustion.
(C) They are composed entirely of hydrogen and oxygen without carbon.
(D) CO_2 released equals CO_2 absorbed by the plants during growth.
(E) Answer not known

136. Which of the following pairs is correctly matched regarding Biofuel Policies in India?
(A) National Policy on Biofuels 2018 - Promoting only 1G biofuels
(B) GOBARdhan scheme - Converting cattle dung and solid waste into biogas
(C) PM JI-VAN yojana - Subsidizing crude oil imports
(D) SATAT initiative - Producing electricity exclusively from solar panels
(E) Answer not known

137. Consider the following statements about Algal biofuels (3G biofuels):
I. Microalgae can produce much higher yields of oil per acre than traditional crops.
II. They do not compete with food crops for arable land.
III. They require large amounts of fresh drinking water to cultivate.
IV. They can utilize carbon dioxide emissions from power plants.
V. The technology is completely matured and currently cheaper than fossil fuels.
Which of the above statement(s) is/are correct?

Downloaded from www.pdf.tube

ANSWERS

1. (C) Fuels from fossilized organic remains decomposed over millions of years
Fossil fuels originate from organic matter such as ancient plants and microscopic organisms. Over millions of years, these remains were buried under thick layers of sedimentary rock. Intense pressure and heat within the earth's crust transformed this biological material into energy-rich resources like coal, natural gas, and crude petroleum which are now extracted for various uses.

2. (A) Both A and R are true and R is the correct explanation of A.
Anthracite represents the final stage of coal formation, boasting the highest carbon content, often exceeding eighty-six percent. This high concentration results in a greater heating value and minimal impurities. Its low moisture content ensures it burns with a clean, smokeless flame, making it the most efficient and highest quality coal available for industrial and domestic purposes worldwide.

3. (A) P-IV, Q-III, R-II, S-I
Coal classification is based on carbon concentration and geological age. Peat has the lowest carbon content, typically under twenty percent, while lignite ranges between twenty-five and thirty-five percent. Bituminous coal contains forty-five to eighty-six percent carbon, and anthracite, the highest grade, reaches eighty-six to ninety-seven percent carbon, reflecting intense metamorphism and providing the highest energy density available.

4. (A) Decomposition of marine microbes buried under layers of sedimentary rocks
Crude petroleum forms primarily from the anaerobic decomposition of microscopic marine organisms like plankton and algae. When these organisms die, they sink to the ocean floor and mix with sediments. Over millions of years, heat and pressure transform the organic debris into liquid hydrocarbons trapped within porous sedimentary rock layers, creating the vast underground reservoirs found today.

5. (A) I and II only
Crude oil is a complex mixture consisting largely of hydrocarbons, which are compounds made of hydrogen and carbon. These include various alkanes, cycloalkanes, and aromatic structures. Additionally, petroleum contains small quantities of non-hydrocarbon elements such as sulfur, nitrogen, and oxygen, which must often be removed during the refining process to ensure fuel quality and meet environmental standards.

6. (A) Fractional distillation
Fractional distillation is the fundamental process used in refineries to separate the complex mixture of crude oil. It relies on the different boiling points of various hydrocarbon components. In a distillation tower, crude oil is heated, and as vapors rise, they condense at specific temperatures into distinct fractions like petrol, diesel, and kerosene, allowing for efficient large-scale production.

(D) Diesel - Lubricating heavy machinery
Diesel is primarily utilized as a fuel for heavy-duty internal combustion engines found in trucks, buses, and industrial machinery. While petroleum products like lubricating oils are specifically designed for reducing friction in machinery, diesel provides the necessary energy for propulsion. Asphalt is used for roads, and kerosene serves as fuel for aviation and various domestic heating systems.

8. (A) III, I, II, IV
In petroleum refining, fractions are separated based on their boiling points, which correlate with molecular weight. Liquefied petroleum gas has the lowest boiling point, followed by petrol, which contains lighter hydrocarbons. Diesel consists of heavier molecules with higher boiling points, while lubricating oil is composed of long-chain hydrocarbons that remain liquid at even higher temperatures during the distillation process.

NODIA

(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III
(E) Answer not known

146. Which rating measures the ignition delay of diesel fuel under compression?
(A) Octane rating
(B) Cetane rating
(C) Viscosity index
(D) Calorific value
(E) Answer not known

147. Which of the following pairs concerning industrial hubs in Tamil Nadu is correctly matched?
(A) SPIC (Southern Petrochemical Industries Corporation) - Coimbatore
(B) MFL (Madras Fertilizers Limited) - Madurai
(C) NLC (Neyveli Lignite Corporation) - Trichy
(D) CPCL (Chennai Petroleum Corporation Limited) - Manali
(E) Answer not known

148. Consider the following major steps of the industrial synthesis of urea:
I. Reaction of ammonia and carbon dioxide to form ammonium carbamate
II. Production of ammonia via Haber process
III. Dehydration of ammonium carbamate to form urea
IV. Prilling or granulation of liquid urea
Which of the following represents the correct sequential order?
(A) II, I, III, IV
(B) I, II, III, IV
(C) II, III, I, IV
(D) I, III, II, IV
(E) Answer not known

149. According to a Soil Health Card, if a soil test reveals zinc deficiency, which of the following is the most appropriate corrective recommendation?
(A) Application of excess urea
(B) Increased irrigation
(C) Application of Zinc Sulphate
(D) Application of pure agricultural lime
(E) Answer not known

150. Match the items in List I with the items in List II.
List I: (Hazard Type)
P. Eutrophication
Q. Biomagnification
R. Methemoglobinemia (Blue baby syndrome)
S. Ozone depletion
List II: (Agrochemical Source)
I. DDT and persistent organochlorines
II. Nitrate leaching from excess nitrogen fertilizers
III. Phosphatic fertilizer runoff
IV. Methyl bromide fumigants
Which of the following is the correct matching?
(A) P-III, Q-I, R-II, S-IV
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-II, R-I, S-IV
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

151. Consider the following statements regarding the usage of biopesticides like Trichoderma in agriculture:
I. It is an eco-friendly fungicide used against root rot diseases.
II. It enhances root growth and soil health.
III. It is chemically identical to synthetic organophosphates.
IV. Its production is promoted through bio-control labs.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) I, II, III and IV
(C) II, III and IV only
(D) I and IV only
(E) Answer not known

152. Which of the following statements about micro-irrigation and fertigation is incorrect?
(A) Fertigation allows for the precise application of nutrients along with irrigation water.
(B) Complex water-insoluble fertilizers are preferred for fertigation systems.
(C) It significantly reduces fertilizer leaching and water wastage.
(D) It improves nutrient use efficiency compared to traditional broadcasting.
(E) Answer not known

153. The following question consists of two statements, Assertion (A) and Reason (R).

Click Here to Buy book on Amazon

is characterized by its non-volatile nature and excellent binding properties. These features make it the primary material for road surfacing and waterproofing, as it provides a durable and weather-resistant layer for vital national infrastructure projects worldwide.

19. (D) Alkanes
Alkanes are a class of hydrocarbons where every carbon atom is connected to others by single covalent bonds. Because they contain the maximum possible number of hydrogen atoms per carbon atom, they are referred to as saturated hydrocarbons. Common examples found in fuels include methane, ethane, and propane, which are known for their relative chemical stability and combustion efficiency.

20. (A) Open windows and avoid using any electrical switches or devices.
When a gas leak is suspected, the most critical safety measure is to avoid any source of ignition. Opening windows allows the gas to dissipate into the atmosphere. Using electrical switches can create tiny sparks that might ignite the flammable gas-air mixture. Immediate ventilation through natural airflow is much safer than using electric fans during an emergency kitchen leak.

21. (C) Chemical products derived from petroleum and natural gas
Petrochemicals are chemical substances derived from the processing of petroleum and natural gas. They serve as essential raw materials for manufacturing a vast array of modern products, including plastics, synthetic rubbers, detergents, and fertilizers. By breaking down and rearranging hydrocarbon molecules, industries produce the basic building blocks for many materials used in daily life and various critical industrial applications.

22. (A) Both A and R are true and R is the correct explanation of A.
Thermosetting plastics undergo a permanent chemical change when heated and molded for the first time. During this process, strong covalent cross-links form between the polymer chains, creating a rigid three-dimensional network. These permanent bonds prevent the material from melting or softening upon subsequent heating, making it impossible to reshape the plastic once it has been fully set by heat.

23. (A) P-IV, Q-III, R-I, S-II
Synthetic fibers are engineered for specific industrial and domestic uses. Nylon is prized for its extreme strength and elasticity, making it ideal for parachutes and ropes. Polyester is valued for being wrinkle-resistant in apparel. Rayon, created from processed wood pulp, serves as a substitute for silk. Acrylic provides a lightweight, warm alternative to natural wool in various textile products.

24. (B) High tensile strength and elasticity
Nylon is a synthetic polymer known for its exceptional tensile strength and durability. It possesses high elasticity, allowing it to return to its original shape after stretching. Additionally, nylon has low water absorption and high resistance to abrasion and chemicals. These properties make it highly suitable for manufacturing demanding items such as climbing ropes, fishing nets, and high-performance garments.

25. (C) I only
Rayon is often classified as a semi-synthetic fiber rather than a fully synthetic one. While it undergoes significant chemical processing, its primary raw material is cellulose obtained from wood pulp. This distinguishes it from fibers like nylon or polyester, which are synthesized entirely from petrochemicals. Rayon mimics the texture of natural silk and is highly absorbent, breathable, and comfortable.

NODIA

26. (D) Neoprene
Neoprene is a well-known synthetic rubber produced through the polymerization of chloroprene. It exhibits excellent chemical stability and maintains flexibility over a wide range of temperatures. Unlike natural rubber, neoprene is highly resistant to degradation from oils, sun, and weather. This makes it a preferred material for industrial hoses, gaskets, and specialized apparel like wetsuits for various water sports.

27. (A) Additive used - Sulfur
Vulcanization is a chemical process that involves heating natural rubber with sulfur. This treatment creates sulfur bridges or cross-

9. (C) It is stored as a liquid under high pressure in cylinders.
Liquefied Petroleum Gas consists of flammable hydrocarbon gases, primarily propane and butane. To facilitate efficient transport and storage for domestic and industrial use, these gases are compressed into a liquid state under high pressure and kept in sturdy metal cylinders. It is a clean-burning fuel that provides high energy efficiency with minimal smoke and low environmental impact.

10. (A) P-I, Q-II, R-III, S-IV
Different fuel gases are identified by their primary chemical constituents. Compressed natural gas is mostly methane, while liquefied petroleum gas contains propane and butane. Biogas is a mixture of methane and carbon dioxide produced by anaerobic digestion. Water gas is a synthetic fuel consisting of carbon monoxide and hydrogen, generated by passing steam over hot coke for industrial usage.

11. (A) I, II and III only
Petrol and diesel differ in their chemical structure and ignition properties. Petrol consists of shorter hydrocarbon chains and is measured by octane number for anti-knock quality. Diesel contains longer chains and uses the cetane number to evaluate ignition delay. While petrol engines require spark plugs, diesel engines rely on heat from compression to ignite the fuel mixture effectively.

12. (B) Iso-octane has an octane number of 0.
The octane rating system evaluates the anti-knock performance of gasoline. Iso-octane is assigned a high value of one hundred because it resists premature ignition effectively. In contrast, normal heptane is given a value of zero due to its tendency to knock easily. Higher cetane numbers indicate shorter ignition delays in diesel engines, leading to better combustion and improved efficiency.

13. (C) A is true but R is false.
Kerosene has historically served as a vital fuel for lighting lamps and cooking in rural areas due to its availability. However, it is significantly less volatile than petrol, which makes it safer to handle and store in domestic settings. Because petrol evaporates and ignites much more easily at room temperature, it poses a higher fire risk than kerosene fuels.

14. (B) LPG → Petrol → Kerosene → Diesel
The length of hydrocarbon chains determines the physical properties of petroleum fractions. Liquefied petroleum gas contains the shortest chains, usually three to four carbon atoms. Petrol follows with five to twelve carbons. Kerosene consists of twelve to sixteen carbons, while diesel contains even longer chains, typically ranging from fifteen to over twenty-five carbon atoms in length for various engine types.

15. (C) Premature ignition of the air-fuel mixture
Knocking in an internal combustion engine occurs when the air-fuel mixture ignites prematurely or unevenly before the spark plug fires. This creates shock waves that produce a distinctive metallic sound and can damage engine components. Using fuels with appropriate octane ratings helps prevent this uncontrolled combustion by ensuring the fuel burns smoothly under high compression during engine operation.

16. (D) Tetraethyl lead - Anti-knocking agent
Fuel additives are chemicals added to improve performance. Tetraethyl lead was historically used as a powerful anti-knocking agent to increase the octane rating of petrol, though its use is now restricted due to environmental toxicity. Other additives like ethanol are used to boost octane levels cleanly, while ethyl mercaptan is added to gases specifically to assist in leak detection.

17. (A) I, II, III and IV only
Petroleum refining involves several critical stages to produce high-quality fuels. Fractional distillation separates crude oil components by boiling point. Cracking breaks down large molecules into smaller, high-demand ones like petrol. Reforming alters molecular structures to increase octane ratings. Desulfurization is essential for removing sulfur impurities, which prevents the formation of harmful sulfur dioxide emissions during the combustion process in engines.

18. (B) Asphalt
Asphalt, also known as bitumen, is a heavy, dark, and highly viscous petroleum fraction obtained from the bottom of the distillation column. It

Downloaded from www.pdf.tube

36. (A) Basic dyes - Primarily used for cotton without a mordant
Basic dyes are cationic and have a strong affinity for acidic groups. They are commonly used for acrylic fibers and certain types of paper. However, they do not bond well to cotton unless a mordant is used first. Azo dyes are the most common class, characterized by nitrogen-nitrogen double bonds. Vat dyes are insoluble but become soluble when reduced for application.

37. (A) I, II, III and IV only
Explosives are unstable chemical compounds that decompose extremely fast when triggered. This reaction releases immense amounts of gas and heat, creating a powerful shockwave. Common explosives include TNT, dynamite, and RDX. While their use is strictly regulated, they are essential in industries like mining and construction for blasting rock. Controlled usage is necessary for safety and efficiency in various industrial sectors.

38. (A) Highly exothermic and rapid
An explosive chemical reaction is characterized by its extreme speed and highly exothermic nature. The rapid release of energy and the sudden expansion of hot gases create a devastating pressure wave. Unlike slow combustion, an explosion does not necessarily depend on an external oxygen supply, as many explosive molecules contain their own oxygen atoms within their chemical structure for immediate reaction.

39. (D) Response to heat
Plastics are primarily classified into two categories based on their thermal behavior. Thermoplastics soften and melt when heated, allowing them to be recycled and reshaped multiple times. In contrast, thermosetting plastics undergo a chemical cross-linking process during their initial molding that makes them permanently rigid. Once set, they cannot be melted or reshaped, offering high heat resistance and structural stability in various applications.

40. (B) Decompose into harmless substances by natural microbial action.
Biodegradable plastics are increasingly used because they address the long-term waste issues of traditional polymers. These materials are designed to be broken down by microorganisms into harmless substances like water, carbon dioxide, and compost. By using renewable resources like corn starch, these plastics help reduce environmental pollution and the accumulation of waste in landfills, promoting a more sustainable and circular economy.

41. (C) Substances added to soil to provide primary essential nutrients.
Fertilizers are natural or synthetic substances applied to soil or plant tissues to supply essential nutrients. Their primary purpose is to enhance plant growth and increase agricultural yields by providing elements like nitrogen, phosphorus, and potassium. By replenishing nutrients that are naturally depleted during the crop growing process, fertilizers ensure that plants have the necessary resources for healthy development and productivity.

42. (A) Both A and R are true and R is the correct explanation of A.
Nitrogen is a fundamental element for plant life, serving as a key component of chlorophyll, which is essential for photosynthesis. It also forms the basis of amino acids and proteins, which are the building blocks of plant tissue. Therefore, applying nitrogenous fertilizers is crucial for promoting vigorous vegetative growth, ensuring lush green leaves and overall healthy development in various crops.

NODIA

43. (A) P-II, Q-I, R-IV, S-III
Major plant nutrients play distinct physiological roles. Nitrogen is vital for green vegetative growth. Phosphorus is essential for energy transfer and robust root development. Potassium regulates stomatal opening and enhances disease resistance and overall crop quality. Calcium is a critical structural component of cell walls, providing stability. Together, these elements ensure the proper growth, reproduction, and health of various agricultural plants.

44. (B) Zinc
Plants require various nutrients in different quantities for optimal health. Macronutrients like nitrogen, phosphorus, potassium, magnesium, and sulfur are needed in large amounts. In contrast, micronutrients or trace elements, such as zinc, iron, manganese, and boron, are required

stages. It begins with laboratory efficacy testing to ensure the product works. This is followed by field trials to evaluate its performance under real-world conditions. The data is then submitted to the CIBRC for review. Only after receiving formal registration can the pesticide be legally sold commercially.

115. (D) Emitting synthetic chemical attractants to lure and trap insects.
Pheromone traps are highly specific mechanical tools used in integrated pest management. They work by releasing synthetic versions of the natural chemical attractants—pheromones—that insects use to find mates. Pests are lured toward the source and become trapped, allowing farmers to monitor their populations and determine if control is needed. This targeted approach is environmentally friendly and minimizes chemical usage.

116. (A) Weed - A beneficial plant that repels insects
In agricultural science, different terms describe the organisms in the ecosystem. A weed is generally defined as a plant growing where it is not wanted, often competing with crops for resources. Parasitoids and predators are beneficial organisms that help control pest populations. Pathogens are microorganisms that cause disease in pests. Weeds are typically viewed as negative factors in modern crop production.

117. (A) I, II, III and V only
Exposure to chemical pesticides poses various risks to human health. Acute poisoning can lead to immediate symptoms like nausea and respiratory distress. Long-term exposure is associated with serious conditions, including neurological disorders and cancers. Farm workers are at high risk and must use protective equipment. While many modern pesticides are targeted, they are not inherently safer than botanical extracts for human contact.

118. (A) Endosulfan
Endosulfan is a highly toxic organochlorine pesticide that was banned globally due to its environmental persistence and impact on human health. In India, it gained attention after a public health disaster in Kasargod, Kerala, where aerial spraying led to widespread neurological disorders and birth defects. Following significant legal action, the Supreme Court of India eventually banned its manufacture and use nationwide.

119. (D) Extracts of plants having insecticidal properties
Botanical pesticides are natural substances derived from plants that possess inherent insecticidal or fungicidal properties. Common examples include pyrethrum from chrysanthemums. These pesticides are often preferred in organic farming because they generally have lower toxicity to mammals and tend to break down more quickly in the environment than synthetic chemicals. They provide an effective way to manage pests while minimizing residues.

120. (B) Recall and safe destruction or rejection of the batch
If a batch of food is found to have pesticide residues exceeding the permissible limits set by regulators like the FSSAI, it is considered unsafe. The most appropriate and mandatory action is to immediately recall the affected batch from the market. The produce must then be safely destroyed or rejected to prevent it from reaching consumers, ensuring overall public health protection.

121. (C) Fuels derived directly from recently living biological matter or biomass
Biofuels are energy sources derived from recently living biological materials, known as biomass. This includes plant matter, agricultural residues, and animal waste. Unlike fossil fuels, which take millions of years to form, biofuels are produced from renewable resources that can be replenished relatively quickly. They can be processed into liquid, gas, or solid forms for various sustainable energy applications today.

122. (A) Both A and R are true and R is the correct explanation of A.
Blending ethanol with petrol is a key strategy for reducing India's heavy reliance on imported crude oil. Ethanol can be produced domestically from sugarcane, which supports local farmers and the rural economy. Furthermore, adding ethanol to fuel promotes more complete combustion, which helps lower tailpipe emissions of carbon monoxide. This policy contributes to both national energy security and environmental goals.

Click Here to Buy book on Amazon

and potassium—in a single granule. This integrated approach simplifies the application process for farmers, ensuring that crops receive a balanced supply of essential nutrients simultaneously, which promotes more uniform growth and better overall agricultural yield.

54. (C) N-P-K
In agriculture, the standard notation for describing the nutrient content of a fertilizer is the N-P-K ratio. This sequence represents the percentage by weight of nitrogen, phosphorus, and potassium present in the product. For example, a 10-20-10 fertilizer contains ten percent nitrogen, twenty percent phosphorus, and ten percent potassium, allowing farmers to tailor applications to the specific needs of their soil.

55. (D) Supplying nutrients in proportions matching crop and soil needs.
A balanced NPK ratio does not mean using equal amounts of every nutrient. Instead, it involves supplying nitrogen, phosphorus, and potassium in specific proportions that match the current needs of the crop and the existing nutrient status of the soil. This scientific approach maximizes fertilizer efficiency, prevents environmental pollution from over-application, and ensures optimal plant health and sustainable agricultural yields over time.

56. (B) Muriate of Potash - Potassium sulfate
Muriate of potash is chemically identified as potassium chloride, not potassium sulfate. While both are potassic fertilizers, they differ in their chemical composition and suitability for specific crops. Urea provides nitrogen in the amide form, and single superphosphate provides water-soluble phosphorus. Diammonium phosphate is a popular complex fertilizer providing both nitrogen and phosphorus, making it a versatile choice for farmers.

57. (A) I, II, III and IV only
Neem coated urea offers several advantages over plain urea. The neem oil acts as a natural nitrification inhibitor, which slows the conversion of urea into mobile nitrates. This results in more gradual nitrogen release, reduced leaching into groundwater, and improved nutrient efficiency. Additionally, the coating prevents the illegal diversion of agricultural urea for industrial purposes, ensuring subsidized fertilizer reaches intended farmers.

58. (D) Supplying recommendations of nutrients and fertilizers required for individual farms.
The Soil Health Card Scheme is a government initiative designed to help farmers understand the nutrient status of their land. Each card provides a detailed report of the soil's chemical properties and recommends the exact types and quantities of fertilizers needed for different crops. By following these recommendations, farmers can avoid excessive fertilizer use, reduce input costs, and maintain long-term soil health.

59. (A) Straight fertilizers
Straight fertilizers are chemical products that provide only one of the three primary plant nutrients: nitrogen, phosphorus, or potassium. Examples include urea, which supplies only nitrogen, and muriate of potash, which provides only potassium. These fertilizers allow farmers to address specific nutrient deficiencies in the soil without adding other elements that might already be present in sufficient quantities, providing management flexibility.

60. (B) Making essential nutrients affordable to ensure national food security.
The primary goal of providing fertilizer subsidies in India is to ensure that essential agricultural inputs remain affordable for all farmers, particularly those with small holdings. By lowering the cost of nutrients, the government encourages adequate fertilizer use to maximize crop yields. This policy is fundamental to maintaining national food security and supporting the livelihoods of the rural population while keeping prices stable.

61. (B) System relying on crop rotation and compost to maintain soil productivity.
Organic farming is a holistic agricultural system that emphasizes ecological balance and soil health. It avoids the use of synthetic chemical fertilizers and pesticides. Instead, it relies on natural methods such as crop rotation, green manures, and composting to maintain soil productivity and manage pests. This approach aims to produce safe food while preserving the environment, biodiversity, and long-term sustainability.

Downloaded from www.pdf.tube

bulky manures like compost. Examples include oil cakes, bone meal, and fish meal. Because they provide more nitrogen, phosphorus, or potassium per unit of weight, smaller quantities are required to meet crop needs. They are an excellent way to provide nutrients while improving soil activity.

80. (D) Ensure food security while preserving soil health and ecosystems.
In regions like Tamil Nadu, adopting sustainable agriculture is vital for balancing food production with environmental preservation. This approach aims to ensure long-term food security by using resources efficiently without depleting groundwater or degrading soil health. By integrating traditional knowledge with modern ecological practices, sustainable farming protects ecosystems, maintains biodiversity, and provides a stable livelihood for farmers while reducing chemical reliance.

81. (C) Substances intended for preventing, destroying, or mitigating any pest.
Pesticides are substances or mixtures designed to prevent, destroy, repel, or mitigate pests that interfere with human activities, particularly in agriculture. These pests include insects, weeds, fungi, and rodents that can damage crops or transmit diseases. While they are essential for protecting food supplies, their use is strictly regulated to minimize potential risks to human health and the natural environment.

82. (A) Both A and R are true and R is the correct explanation of A.
In modern intensive agriculture, pesticides are often necessary to protect high-yield crops from significant losses. Insects, weeds, and pathogens can drastically reduce both the quality and quantity of a harvest. By managing these pests, farmers can ensure a more stable and abundant food supply. This is particularly important for global food security, as it helps prevent widespread failures and shortages.

83. (A) P-IV, Q-I, R-III, S-II
Pesticides are classified according to the specific organisms they are designed to control. Insecticides target harmful insects. Herbicides are used to eliminate weeds that compete with crops for nutrients and water. Fungicides prevent or treat diseases caused by fungal pathogens. Rodenticides are formulated to kill pests like rats and mice. Each category uses different chemical mechanisms to address pest vulnerabilities.

NODIA

84. (A) An organochlorine insecticide known for its environmental persistence.
DDT is a well-known organochlorine insecticide that was widely used in the mid-twentieth century. It is characterized by its extreme environmental persistence, meaning it does not break down easily in nature. This property, combined with its tendency to accumulate in the fatty tissues of animals, led to its ban in many countries. Its long-term ecological impacts were eventually found detrimental.

85. (A) I and II
Malathion is a widely used organophosphate insecticide employed in agriculture, public health, and home gardening. It works by disrupting the nervous system of insects. One of its key advantages is that it has relatively low toxicity to mammals and humans compared to other chemicals in the organophosphate class. It breaks down more quickly in the environment than older persistent pesticides.

86. (A) Acetylcholinesterase
Organophosphate insecticides work by targeting the nervous system of pests. They specifically inhibit the activity of the enzyme acetylcholinesterase, which is responsible for breaking down the neurotransmitter acetylcholine. When this enzyme is blocked, acetylcholine accumulates in the nerve synapses, leading to overstimulation of the nervous system, paralysis, and eventually death. This mechanism is effective but requires very careful handling for safety.

87. (D) Pre-emergent herbicide - Applied before the weed seeds germinate
Herbicides are classified by their selectivity and the timing of their application. A selective herbicide kills only specific weeds without harming the crop. A non-selective herbicide kills all plants it touches. A pre-emergent herbicide is applied to the soil before weed seeds germinate to prevent them from growing. A post-emergent herbicide is applied directly to the foliage of sprouted weeds.

plant roots, primarily to improve the uptake of phosphorus from soil.

71. (A) I, II and IV only
Eutrophication is an environmental process triggered by excess nutrients, particularly nitrogen and phosphorus, entering water bodies from agricultural runoff. This leads to rapid algal blooms, which cover the water surface. When these algae die and decompose, the process consumes vast amounts of dissolved oxygen. This depletion of oxygen results in the death of fish and other aquatic life, disrupting the ecosystem.

72. (B) It mandates a complete ban on the production of synthetic urea by 2025.
The PM-PRANAM scheme was launched to incentivize states to reduce their consumption of chemical fertilizers and adopt alternative or organic options. It aims to lower the government's subsidy burden and promote sustainable farming practices. However, the scheme does not mandate a complete ban on synthetic urea production. Instead, it focuses on the balanced and rationalized use of nutrients to protect soil.

73. (A) Both A and R are true and R is the correct explanation of A.
Continuous application of ammonium sulphate can lead to increased soil acidity over time. When plants absorb the ammonium ions for growth, they release hydrogen ions into the soil. Furthermore, the remaining sulphate ions can react with water to form a weak acidic environment. To prevent soil degradation, it is often necessary to apply lime amendments to neutralize acidity caused by fertilizers.

74. (B) Broadcasting → Band placement → Fertigation
Fertilizer application methods vary in their precision and efficiency. Broadcasting involves spreading fertilizer over the entire field, which is the least precise method. Band placement is more efficient, as it places nutrients near the plant roots. Fertigation, the process of applying water-soluble fertilizers through a drip irrigation system, is the most precise, delivering nutrients directly to the root zone for uptake.

75. (A) Symbiotic bacteria fix nitrogen with plants; free-living fix it independently.
Nitrogen-fixing bacteria are categorized by how they live in the environment. Symbiotic bacteria, such as Rhizobium, must live within the tissues of a host plant, typically in root nodules, to fix nitrogen. In contrast, free-living bacteria like Azotobacter operate independently in the soil or water. Both types are beneficial to agriculture as they convert atmospheric nitrogen into usable plant forms.

76. (B) Farmyard manure - Exclusively chemical ash
Organic fertilizers are derived from biological sources and are not composed of synthetic chemicals. Farmyard manure consists of decomposed animal waste and litter, providing a wide range of nutrients. Compost is made from recycled plant and animal residues. Green manure involves plowing living crops into the soil. These materials improve soil physical properties and support microbial life, unlike inert chemical ash.

77. (A) I, II, IV and V only
Organic farming offers numerous environmental and long-term agricultural advantages. It enhances soil fertility and structure through natural inputs, promotes biodiversity, and reduces the carbon footprint by avoiding synthetic chemicals. It also protects water resources from agrochemical contamination. While it ensures sustainable soil health, it may not guarantee higher yields than chemical farming in the first year as soil recovery takes time.

78. (A) Establishing standards and procedures for organic certification.
The National Programme for Organic Production is a regulatory framework in India that establishes the standards for organic products. It provides a formal system for the certification of organic farms and processing units, ensuring that products meet specific quality and environmental criteria. This certification is essential for building consumer trust and enabling the export of organic goods to various international markets.

79. (C) Concentrated organic manures
Concentrated organic manures are made from animal or plant residues that contain significantly higher nutrient concentrations than

Click Here to Buy book on Amazon

only in very small quantities. Zinc, for instance, is essential for enzyme activation and protein synthesis despite the low amount needed by the plant.

45. (A) I and II
Identifying nutrient deficiencies is critical for effective crop management. A lack of nitrogen typically causes chlorosis, or yellowing, starting with the older leaves as the plant redistributes the mobile nutrient to newer growth. Conversely, phosphorus deficiency often leads to stunted growth and a distinctive dark green or purplish tint on the foliage. Recognizing these visible signs allows farmers to apply correct fertilizers.

46. (A) Rhizobium
Rhizobium is a well-known genus of bacteria that forms a symbiotic relationship with leguminous plants. These bacteria live in specialized root nodules where they convert atmospheric nitrogen gas into ammonia, a form that the plant can readily use for growth. In exchange, the plant provides the bacteria with carbohydrates. This biological process is a vital natural source of nitrogen in ecosystems.

47. (C) Nitrification - Conversion of ammonia to nitrites and nitrates
The nitrogen cycle involves several distinct biological processes. Nitrification is the two-step conversion of ammonia into nitrites and then nitrates by specialized soil bacteria. Ammonification involves the decomposition of organic nitrogen into ammonia. Denitrification converts nitrates back into atmospheric nitrogen gas. Nitrogen fixation is the process where atmospheric nitrogen is captured and converted into ammonia, making it available for uptake.

48. (A) II, III, I, IV
The nitrogen cycle starts with nitrogen fixation, where atmospheric gas is converted into ammonia. This is followed by nitrification, which transforms ammonia into nitrates. Plants then absorb these nitrates through assimilation to build proteins. Finally, when plants and animals die, ammonification occurs as decomposers break down organic matter back into ammonia, completing the cycle and returning nitrogen to the soil.

49. (C) It contains about 46% nitrogen by weight.
Urea is the most widely used nitrogenous fertilizer in the world. It is a synthetic organic compound that contains a high concentration of nitrogen, approximately forty-six percent by weight. Upon application to the soil, urea is hydrolyzed into ammonium and then nitrates, which are absorbed by plants. It is valued for its high nutrient density, ease of handling, and cost-effectiveness.

50. (A) P-III, Q-IV, R-I, S-II
Fertilizers are classified by the nutrients they provide. Superphosphate is a classic phosphatic fertilizer. Ammonium sulphate is a nitrogenous fertilizer that also provides sulfur. Muriate of potash is a primary source of potassium. Diammonium phosphate is a complex fertilizer because it supplies both nitrogen and phosphorus simultaneously. Each type is selected based on the specific nutrient requirements of the soil and crop.

51. (B) III and IV only
Phosphatic fertilizers like superphosphate are essential for root growth. However, it is incorrect to say that diammonium phosphate provides only phosphorus, as it also contains nitrogen. Furthermore, unlike nitrogen, phosphorus is relatively immobile in most soils and does not leach easily into groundwater. Instead, it tends to bind with soil minerals, requiring careful management to ensure it remains available for plants.

52. (A) Used primarily to promote early flowering.
Potassic fertilizers are primarily used to enhance the overall quality, water regulation, and stress tolerance of crops. They play a key role in activating enzymes and regulating stomatal movement. While phosphorus is more closely associated with early flowering and root development, potassium is vital for fruit quality and stalk strength. Muriate of potash is the most common form used in agriculture.

53. (A) Both A and R are true and R is the correct explanation of A.
NPK fertilizers are referred to as complex or compound fertilizers because they are manufactured to contain two or more of the primary macronutrients—nitrogen, phosphorus,

NODIA

88. (A) II, IV, I, III
Biomagnification is the process where the concentration of a persistent pesticide like DDT increases as it moves up the food chain. It begins with producers like phytoplankton absorbing the chemical from the water. Zooplankton then eat the phytoplankton, followed by small fish consuming the zooplankton. Finally, fish-eating birds at the top of the food chain accumulate the highest concentrations in nature.

89. (C) 2,4-D is a common selective herbicide used to control broadleaf weeds.
Herbicides are essential tools for managing weeds in agriculture. A common example is 2,4-D, which is a selective herbicide specifically designed to control broadleaf weeds while leaving cereal crops like wheat unharmed. In contrast, glyphosate is a non-selective herbicide that kills almost all green plant tissue it contacts. Using herbicides requires careful application to prevent drift onto non-target plants.

90. (A) P-III, Q-I, R-II, S-IV
Fungicides are used to manage plant diseases through different strategies. Protectant fungicides are applied before infection to create a barrier. Eradicant fungicides are used to kill the fungus after it has already infected the tissue. Systemic fungicides are absorbed by the plant and move internally to protect new growth. Bordeaux mixture is a classic fungicide made of copper sulphate and lime.

91. (A) I, II and IV only
Rodenticides are specialized chemicals designed to control populations of rats, mice, and other rodents. Zinc phosphide is a common acute poison used for this purpose. Another class includes anticoagulants, which work by preventing blood from clotting, eventually causing internal bleeding. Because these substances are highly toxic, they must be used with extreme caution to prevent accidental poisoning of non-target animals.

92. (B) They are specifically designed to be safe for human inhalation.
Fumigants are volatile chemical compounds that exist as gases at room temperature and are used to kill pests in enclosed spaces. They are highly effective for treating stored grains in silos because they can penetrate deep into materials. However, they are extremely hazardous to humans and must never be inhaled. Aluminum phosphide is a common fumigant that releases toxic phosphine gas.

93. (A) Both A and R are true and R is the correct explanation of A.
Broad-spectrum pesticides are designed to kill a wide variety of insect species. While they effectively reduce the target pest population initially, they also eliminate beneficial predators and parasites that naturally control those pests. Without these natural enemies, the remaining pest population can quickly rebound, often reaching higher levels than before the pesticide was applied, a phenomenon known as pest resurgence.

94. (A) I, II, III, IV
Safe pesticide use begins with carefully reading the label to understand the correct dosage and safety precautions. The chemical should then be mixed in a well-ventilated area while wearing protective gear. After spraying the crop according to instructions, it is essential to dispose of empty containers and any leftover solution safely to prevent environmental contamination and accidental exposure to various animals.

95. (C) The time required for half of the applied pesticide to degrade into other chemicals
The concept of half-life describes the persistence of a pesticide in the environment. It is the amount of time required for half of the original quantity of the chemical to break down through biological or chemical processes. Pesticides with long half-lives are more likely to persist, potentially leading to long-term ecological risks and the accumulation of residues in the food.

96. (D) Cotton bollworm - Herbicides
Controlling agricultural pests requires using the correct type of pesticide. Fungal diseases are managed with fungicides, and soil-borne nematodes are controlled with nematicides. Insect outbreaks, such as locust swarms, require insecticides. However, herbicides are used only for controlling weeds. Managing an insect pest like the cotton bollworm requires insecticides or biological control agents, as herbicides would have no effect whatsoever.

Downloaded from www.pdf.tube

97. (A) I, II, III and V only
Chemical pesticides can cause several environmental problems. They can leach into groundwater, harming water quality and aquatic life. They are a major factor in the decline of essential pollinators like bees. Overuse leads to resistance in pest populations and the bioaccumulation of toxins in food chains. Unlike organic matter, chemical pesticides do not improve soil structure; they may disrupt ecosystems.

98. (B) Are generally host-specific and decompose quickly in the environment
Biopesticides are derived from natural materials such as plants, bacteria, and certain minerals. Unlike many synthetic chemicals, they are usually host-specific, meaning they target only a particular pest and do not harm beneficial insects. They also decompose rapidly in the environment, which significantly reduces the risk of long-term pollution and the development of pesticide resistance in modern agricultural pest populations.

99. (D) Organophosphates
Malathion and parathion belong to the organophosphate class of pesticides. These are synthetic chemicals derived from phosphoric acid and are among the most widely used insecticides today. They are valued for their effectiveness in controlling a broad range of pests but are known for their acute toxicity. Unlike organochlorines, they generally degrade more quickly in the environment, though they still require handling.

100. (A) Washing with water and mild salt or vinegar solutions.
To reduce the intake of pesticide residues from fresh produce, consumers should follow simple cleaning procedures. Washing vegetables and fruits thoroughly with running water can remove a significant portion of surface residues. Using a mild solution of salt or vinegar can further help in dissolving some chemical traces. Peeling the skin of certain fruits also reduces exposure to accumulated chemicals.

101. (C) Suppression of pest populations by living predators or pathogens.
Biological pest control is a method of managing agricultural pests using their natural enemies. This involves the deliberate use of predators, parasites, or pathogens to reduce pest populations to a level where they no longer cause significant economic damage. This approach is a cornerstone of sustainable agriculture, as it provides a natural and often self-sustaining way to protect various commercial crops.

102. (A) Both A and R are true and R is the correct explanation of A.
Biological control is highly valued in sustainable farming because it is environmentally safe and specifically targets pests without harming beneficial insects. Once established, these biological agents can often sustain themselves, providing long-term protection without recurring costs. This specificity prevents ecological disruptions often caused by broad-spectrum pesticides, such as the destruction of pollinators and the development of chemical resistance in pests.

103. (A) P-IV, Q-III, R-II, S-I
Biocontrol agents are living organisms used to manage specific pests. The ladybird beetle is a well-known predator that consumes aphids. Trichogramma is a tiny wasp that acts as an egg parasitoid, preventing the birth of harmful caterpillars. Bacillus thuringiensis is a bacterium lethal to many caterpillars. Trichoderma viride is a beneficial fungus that acts as an antagonist against soil-borne pathogens.

104. (B) Strategy combining various tools to manage pests economically.
Integrated Pest Management is a comprehensive strategy that combines various biological, cultural, mechanical, and chemical tools to manage pests in an economically and environmentally sound manner. Rather than relying on a single method, IPM focuses on keeping pest populations below the level where they cause economic loss. This balanced approach prioritizes long-term sustainability, human health, and the protection of beneficial organisms.

105. (A) I and II only
The core of Integrated Pest Management involves using diverse control methods in a coordinated way. Cultural controls like crop rotation prevent pest buildup. Mechanical controls, such as pheromone traps, help monitor and trap specific

NODIA

pests. IPM discourages the indiscriminate spraying of broad-spectrum pesticides. Instead, chemical treatments are used only as a last resort and are targeted specifically to minimize environmental damage.

106. (D) Pest density at which control measures should be initiated.
In the framework of Integrated Pest Management, the Economic Threshold Level is the pest population density at which a control measure must be taken to prevent the population from reaching the Economic Injury Level. At this point, the cost of control is justified by the value of the crop saved. Monitoring pest levels allows farmers to apply pesticides only when truly necessary.

107. (A) Time interval between the last pesticide application and harvest.
Regulating pesticides involves several key safety metrics. The pre-harvest interval is the mandatory waiting period between the last application of a pesticide and the time the crop can be safely harvested. This ensures that residues have enough time to degrade to safe levels. The Maximum Residue Limit is the legal maximum amount of pesticide allowed on food for safe human consumption.

108. (A) I, III, II, IV
Implementing an Integrated Pest Management program follows a logical sequence. First, the specific pest must be accurately identified. Next, the population is monitored and assessed to determine if control is needed. If the economic threshold is met, appropriate control tactics, such as biological or chemical measures, are implemented. Finally, the effectiveness of these measures is evaluated to inform future management.

109. (B) Neem oil (Azadirachtin)
Bio-pesticides are natural alternatives to synthetic chemicals. Neem oil, which contains the active compound azadirachtin, is a prominent example. It works by disrupting the growth and reproduction of a wide range of insect pests. Unlike synthetic organophosphates, neem-based products are generally safe for humans and beneficial insects, and they break down quickly in the environment, making them ideal for farming.

110. (A) P-IV, Q-III, R-II, S-I
Pesticide regulation in India involves multiple bodies and laws. The Food Safety and Standards Authority of India sets safety standards for residues in food. The Central Insecticides Board and Registration Committee handles the registration of new pesticides. The Insecticides Act of 1968 provides the legal framework. Internationally, the Codex Alimentarius Commission establishes global standards for pesticide residues to facilitate trade.

111. (A) I, III and IV only
Managing pesticide residues is vital for food safety. The Maximum Residue Limit is the highest concentration of a pesticide legally allowed in food, set for safety. Exceeding the limit does not necessarily cause immediate toxicity, but indicates a failure in agricultural practices. Regulators conduct regular monitoring, and consumers can further reduce exposure by washing or peeling produce before safe consumption.

112. (D) It provides direct financial subsidies to pesticide manufacturing companies.
The Central Insecticides Board is a statutory body that advises the Indian government on technical matters related to the Insecticides Act. Its responsibilities include specifying how pesticides should be used and determining the safe proportions for formulations. However, the Board does not provide financial subsidies to pesticide manufacturers. Its primary focus is on safety, efficacy, and regulatory oversight to protect health.

113. (A) Both A and R are true and R is the correct explanation of A.
Registering a new pesticide in India is a rigorous process that requires extensive data on its effectiveness, toxicity, and environmental impact. This strict regulation is necessary because agrochemicals can have significant non-target effects and lead to long-term health consequences. By thoroughly evaluating each molecule, the Registration Committee ensures that only products that can be used safely are allowed for agricultural usage.

114. (A) I, II, III, IV
The path for a new pesticide from development to the market involves several critical regulatory

Click Here to Buy book on Amazon

62. (A) Both A and R are true and R is the correct explanation of A.
While chemical fertilizers provide immediate nutrients, their excessive and long-term use can negatively impact soil health. They can alter the soil's natural pH, making it too acidic or alkaline for many crops. Furthermore, high concentrations of synthetic salts can harm beneficial soil microorganisms that are essential for nutrient cycling and soil structure. Over time, this leads to soil fertility decline.

63. (A) P-I, Q-IV, R-II, S-III
Various organic inputs are used to enrich the soil. Vermicompost is produced by earthworms breaking down organic waste. Green manure involves growing and then plowing leguminous crops back into the soil. Farmyard manure is a traditional mixture of animal dung, urine, and bedding. Bio-fertilizers are preparations containing live microorganisms that help in nutrient fixation or mobilization when applied to the soil surface.

64. (D) Humus, enzymes, and beneficial microbes
Vermicompost is a nutrient-rich organic fertilizer produced through the joint action of earthworms and microorganisms. The earthworms consume organic waste and excrete castings that are high in humus, enzymes, and beneficial microbes. This material improves soil structure, aeration, and water-holding capacity. It provides a balanced array of plant nutrients in a readily available form, enhancing crop growth more effectively than compost.

65. (A) I and II
Green manure is a sustainable practice that involves growing specific crops, particularly legumes, and incorporating them into the soil while still green. This process significantly improves soil structure and organic matter content. Leguminous crops have the added benefit of fixing atmospheric nitrogen in their roots, which becomes available to the next crop as they decompose, reducing the need for nitrogenous fertilizers.

66. (B) Azotobacter
Azotobacter is a genus of free-living, aerobic bacteria found in the soil that can fix atmospheric nitrogen without forming a symbiotic relationship with plant roots. By converting gaseous nitrogen into ammonia, it enriches the soil's nutrient content. In addition to nitrogen fixation, Azotobacter also produces growth-promoting substances like vitamins and hormones, which further benefit the development of various non-leguminous agricultural crops.

67. (D) Azolla - Rice fields
Azolla is a small aquatic fern that lives in a symbiotic relationship with nitrogen-fixing blue-green algae. It is widely used as a bio-fertilizer in waterlogged rice fields, where it multiplies rapidly and provides a significant natural source of nitrogen. Other bio-fertilizers include Rhizobium for legumes and Mycorrhiza, which is a fungus that helps plant roots absorb phosphorus and water more efficiently.

68. (A) III, IV, I, II
The process of vermicomposting begins with selecting a suitable shaded site and preparing a pit or tank. Next, layers of organic waste and cow dung are added to create a favorable environment. Earthworms are then released into the mixture to begin the decomposition process. Finally, after several weeks of activity, the nutrient-rich vermicompost is harvested and sieved for agricultural use.

69. (C) Fixing atmospheric nitrogen primarily in waterlogged rice paddy environments.
Blue-green algae, also known as cyanobacteria, are photosynthetic microorganisms capable of fixing atmospheric nitrogen. They are particularly effective in flooded rice paddies, where they form a thick layer and contribute significantly to soil nitrogen levels. This natural fertilization reduces the reliance on chemical urea. These organisms are beneficial to the ecosystem, providing nutrients without the harmful runoff associated with synthetic fertilizers.

70. (A) P-II, Q-I, R-IV, S-III
Bio-fertilizers are often selected for specific crops or environments. Rhizobium is the standard choice for legumes like pulses. Azospirillum is frequently used for non-leguminous crops like sugarcane and maize to enhance nitrogen availability. Blue-green algae are ideal for the waterlogged conditions of paddy fields. Mycorrhiza forms a symbiotic association with

NODIA

123. (A) P-IV, Q-I, R-II, S-III
Biofuels are classified into generations based on their source material. First-generation biofuels are made from edible food crops like sugarcane. Second-generation fuels use non-food biomass, such as agricultural residues. Third-generation biofuels are derived from algae, which can produce high yields without using arable land. Fourth-generation technology involves using genetically engineered organisms to capture and convert carbon dioxide into renewable fuel.

124. (B) 20%
The Government of India has set an ambitious target to achieve a twenty percent ethanol blend in petrol across the country by the year 2025. This initiative, known as E20, is designed to reduce the country's oil import bill and promote renewable energy. Achieving this goal requires a significant increase in ethanol production capacity and the adaptation of many vehicle engines.

125. (B) I, II and III
Biodiesel is produced through a chemical process known as transesterification. In this reaction, vegetable oils or animal fats are reacted with an alcohol, typically methanol, in the presence of a catalyst. This process converts triglycerides in the oil into fatty acid methyl esters. Glycerin is also produced as a valuable by-product that can be used in pharmaceutical and cosmetic industries.

126. (A) Methane and Carbon dioxide
Biogas is a renewable fuel produced through the anaerobic digestion of organic matter by specialized bacteria. Its primary component is methane, which provides the fuel's heating value. The remaining portion consists mainly of carbon dioxide, along with small amounts of other gases like hydrogen sulfide. Because both are greenhouse gases, capturing and using biogas as energy helps reduce their environmental impact.

127. (C) Bio-jet fuel - Pulses and cereals
Various feedstocks are used in India to produce different biofuels. Bioethanol is commonly made from sugarcane molasses, while biodiesel can be derived from non-edible oilseeds like Jatropha. Biogas is generated from animal dung and agricultural waste. Bio-jet fuel is typically produced from used cooking oils or specialized non-edible crops, rather than from food grains like pulses and various cereals.

128. (A) II, III, IV, I
The production of biogas through anaerobic digestion occurs in four distinct biological stages. First, hydrolysis breaks down complex organic polymers into monomers. Next, acidogenesis converts these into volatile fatty acids. This is followed by acetogenesis, where acids are transformed into hydrogen and carbon dioxide. Finally, methanogenesis occurs, as specialized archaea convert these precursors into methane, providing a renewable fuel source.

129. (C) Jatropha (Jatropha curcas)
Jatropha curcas is a drought-resistant perennial plant that produces seeds with a high oil content. Because the oil is non-edible and toxic to humans, Jatropha is considered an ideal feedstock for biodiesel production. It can be grown on marginal or degraded lands that are unsuitable for traditional food crops. Promoting its cultivation supports rural development and provides a sustainable fuel source.

130. (A) P-II, Q-IV, R-I, S-III
Biofuels have unique chemical and physical properties. Ethanol has a high octane rating, which helps prevent engine knocking. The calorific value of biogas is determined by its methane concentration. Biodiesel contains more oxygen than conventional diesel, which promotes more complete combustion. However, raw vegetable oils have high viscosity, which must be lowered through transesterification to make them suitable for engines.

131. (D) I, III and IV only
Biofuels offer several significant benefits as an energy source. They are renewable, as the biomass they are made from can be regrown continually. Their production and use promote rural employment and economic development. Furthermore, biofuels are biodegradable and generally less toxic than petroleum-based fuels. While they emit carbon dioxide during combustion, they are often considered part of a circular carbon cycle.

NODIA

(C) II and IV
(D) I and IV
(E) Answer not known

31. Which of the following is not a general characteristic of Phylum Mollusca?
(A) They are generally bilaterally symmetrical and triploblastic.
(B) They must undergo ecdysis or moulting to grow in size.
(C) Their body is unsegmented with distinct body regions.
(D) A soft spongy layer of skin forms a mantle over the visceral hump.
(E) Answer not known

32. Match the fungi in List I with their impact or use in List II:
List I: Fungi
P. Saccharomyces cerevisiae
Q. Puccinia graminis
R. Trichoderma
S. Agaricus bisporus
List II: Impact or Use
I. Causes rust disease in wheat
II. Used as a bio-control agent
III. Edible mushroom
IV. Used in baking industry
(A) P-IV, Q-I, R-II, S-III
(B) P-III, Q-II, R-I, S-IV
(C) P-IV, Q-II, R-I, S-III
(D) P-I, Q-IV, R-III, S-II
(E) Answer not known

33. Consider the following invertebrate phyla. Arrange them in the correct order of their evolutionary complexity, from simplest to most advanced:
I. Porifera
II. Annelida
III. Platyhelminthes
IV. Coelenterata
Which of the following represents the correct sequence?
(A) I - IV - III - II
(B) I - III - IV - II
(C) IV - I - II - III
(D) I - II - III - IV
(E) Answer not known

34. Radial symmetry is a characteristic feature primarily observed in adult organisms of which of the following classifications?
(A) Arthropoda
(B) Platyhelminthes
(C) Echinodermata
(D) Mollusca
(E) Answer not known

35. Which of the following pairs is incorrectly matched?
(A) Aschelminthes - Calcareous ossicles
(B) Porifera - Choanocytes (collar cells)
(C) Coelenterata - Cnidoblasts
(D) Ctenophora - Comb plates
(E) Answer not known

36. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Fungi play a vital ecological role as decomposers in terrestrial ecosystems.
Reason (R): They secrete digestive enzymes externally to break down complex organic matter into simple inorganic compounds.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

37. The presence of a water vascular system that helps in locomotion, capture of food, and respiration is the unique feature of:
(A) Mollusca
(B) Echinodermata
(C) Arthropoda
(D) Annelida
(E) Answer not known

38. Consider the following characteristics of plants:
I. Presence of true roots, stems, and leaves
II. Dominant sporophytic generation
III. Presence of vascular tissues
IV. Production of naked seeds
V. Flowers as reproductive structures
Which of the above features correctly describes Gymnosperms?

Downloaded from www.pdf.tube

141. (B) Chemical breakdown of large hydrocarbons into smaller molecules.
In the petroleum industry, cracking is a crucial chemical process used to break down long-chain, heavy hydrocarbon molecules into smaller, more valuable ones. This is typically achieved through high temperatures and pressures, often using a catalyst. Cracking is essential for increasing the yield of high-demand products like petrol and diesel, allowing refineries to adjust their output to meet market needs.

142. (A) Both A and R are true and R is the correct explanation of A.
Coating urea with neem oil is a significant advancement in fertilizer technology. Neem oil contains natural compounds that act as nitrification inhibitors, slowing down the conversion of urea into nitrates. Because nitrates are easily leached from the soil, this slower release ensures that nitrogen remains in the root zone longer. This improves nutrient use efficiency and minimizes the risk of environmental pollution.

143. (A) P-IV, Q-I, R-II, S-III
Different fertilizer compounds are used to provide specific nutrients. Ammonium nitrate provides nitrogen in both the nitrate and ammoniacal forms. Triple superphosphate is a highly concentrated source of phosphorus. Potassium sulphate is used to supply potassium for sensitive crops. Urea is the most common nitrogenous fertilizer, providing nitrogen in the amide form. Selecting the right compound is essential for productivity.

144. (D) Accumulation of toxic residues in surface water and aquatic ecosystems
In intensive agricultural regions like the Cauvery delta, the heavy use of pesticides can lead to significant problems. During heavy rains, these chemicals can wash off fields and enter local rivers. This runoff leads to the accumulation of toxic residues in surface water and aquatic ecosystems, which can harm wildlife. Over time, these persistent chemicals can also find their way into food.

145. (A) I and II only
The Tamil Nadu Organic Farming Policy was developed to promote safe food production and environmental sustainability. It focuses on encouraging farmers to adopt natural methods, such as the use of bio-fertilizers and bio-pesticides, to maintain soil health. While the policy provides support for organic practices, it does not immediately ban all synthetic fertilizers, aiming instead for a gradual and balanced transition.

NODIA

146. (B) Cetane rating
The cetane rating is a measure of the ignition quality of diesel fuel. It indicates the ignition delay—the time between fuel injection and the start of combustion—under the high-pressure conditions of a diesel engine. A higher cetane number means a shorter ignition delay, which leads to more complete combustion, easier starting, and smoother engine operation compared to lower quality fuels.

147. (D) CPCL (Chennai Petroleum Corporation Limited) - Manali
Tamil Nadu is home to several major industrial facilities in the energy sector. The Chennai Petroleum Corporation Limited (CPCL) operates a large refinery in Manali, which is a key hub for petroleum products. Other major players include the Southern Petrochemical Industries Corporation and Madras Fertilizers Limited. These industrial hubs contribute significantly to the state's energy infrastructure and overall regional economic development.

148. (A) II, I, III, IV
The industrial production of urea follows a specific sequence. It begins with the Haber process to produce ammonia from nitrogen and hydrogen. Next, ammonia is reacted with carbon dioxide under pressure to form ammonium carbamate. This intermediate compound is then dehydrated to produce liquid urea. Finally, the urea is processed through prilling or granulation to create the solid granules used commercially.

149. (C) Application of Zinc Sulphate
When a soil test reveals a deficiency in a micronutrient like zinc, it is essential to apply the correct corrective treatment. The most common and effective recommendation is the application of zinc sulphate. This compound provides a readily available source of zinc for plants. Addressing this deficiency is important because

132. (A) Biodiesel has a higher sulfur content than petrodiesel.
One of the primary environmental advantages of biodiesel over conventional petrodiesel is its significantly lower sulfur content. Burning biodiesel results in much lower emissions of sulfur dioxide, a major contributor to acid rain. Additionally, biodiesel has a higher flash point, making it safer to store, and its superior lubricating properties can extend the life of engine fuel systems during regular usage.

133. (A) Both A and R are true and R is the correct explanation of A.
Bio-CNG, also known as compressed biogas, is a purified form of biogas that has been processed to remove carbon dioxide and hydrogen sulfide. This purification process increases the methane content to over ninety percent, giving it chemical and energy properties very similar to natural gas. Because of its high purity, Bio-CNG can be used as a direct replacement for vehicles.

134. (A) E5 → E10 → E20
India's strategy for integrating ethanol into the fuel supply has followed a gradual progression of increasing blend percentages. This began with lower levels, such as E5, before moving to E10 as production capacity grew. The current national target is to achieve E20 blending by 2025. This step-by-step approach has allowed time for the agricultural sector and automotive industry to adapt accordingly.

135. (D) CO_2 released equals CO_2 absorbed by the plants during growth.
Biofuels are conceptually considered carbon neutral because the carbon dioxide they release when burned is approximately equal to the amount the plants absorbed from the atmosphere during their growth. This creates a closed carbon cycle, unlike fossil fuels. While some emissions occur during processing, the overall net contribution of biofuels to atmospheric carbon levels is lower than that of conventional petroleum-based fuels.

136. (B) GOBARdhan scheme - Converting cattle dung and solid waste into biogas
Several government initiatives in India promote the development of biofuels. The GOBARdhan scheme focuses on managing cattle dung and other solid waste in rural areas by converting them into biogas and organic manure. This promotes cleanliness and provides a clean energy source for cooking. Other policies aim to scale up the production and use of ethanol and biodiesel for the future.

137. (C) I, II and IV only
Algal biofuels offer several major advantages over traditional crop-based fuels. Microalgae can be cultivated on land that is unsuitable for agriculture and can use wastewater, avoiding competition with food production. They have much higher oil yields per acre and can even capture carbon dioxide from industrial sources. However, the technology is still being developed to make it cost-competitive with fossil fuels.

138. (D) Anaerobic fermentation by yeast
The production of bioethanol from sugarcane juice or molasses is primarily a biological process. It involves the anaerobic fermentation of sugars by microorganisms, most commonly yeast. During this process, the yeast breaks down the sugar into ethanol and carbon dioxide. The resulting mixture is then distilled to increase the ethanol concentration and purified to produce a high-purity fuel for engine use.

139. (A) Renewable biological energy
Biogas, bioethanol, and biodiesel are all classified as renewable biological energy sources. They are derived from organic materials that can be replenished through natural biological processes within a relatively short timeframe. This distinguishes them from finite fossil fuels. By using the energy stored in biomass, these biofuels provide a sustainable way to meet energy demands for transportation and power generation.

140. (B) Avoid the food vs. fuel debate by using agricultural residues.
The emphasis on second-generation (2G) biofuels in India is driven by the need to avoid the food vs. fuel debate. Unlike first-generation fuels, 2G biofuels are produced from non-food materials like agricultural residues. This ensures that biofuel production does not compete with food security. Additionally, utilizing agricultural waste helps reduce environmental issues like crop residue burning, which causes pollution.

Click Here to Buy book on Amazon

carrier-based ones. Liquid bio-fertilizers offer several advantages, including a longer shelf life and higher survival rates for the beneficial microorganisms they contain. They are also easier for farmers to handle and apply. By ensuring microbes remain active, liquid formulations provide more consistent and reliable agricultural results.

159. (C) Vat dyes
Vat dyes are a specific class of dyes characterized by their unique application process. They are naturally insoluble in water, so they must be treated with a reducing agent in an alkaline medium to become soluble before application. Once the dye is absorbed, the fabric is exposed to air, causing the dye to oxidize back into its insoluble form within the fibers.

160. (A) Both A and R are true and R is the correct explanation of A.
In highly alkaline soils, the use of certain nitrogenous fertilizers requires careful management. These conditions can trigger chemical reactions that rapidly convert nitrates into volatile ammonia gas. This process, known as ammonia volatilization, leads to a significant loss of nitrogen before plants can absorb it. To prevent this, soil amendments may be needed to ensure nutrients effectively support crop growth and productivity.

www.nodia.in

NODIA

zinc is vital for enzyme function and protein synthesis in various crops.

150. (A) P-III, Q-I, R-II, S-IV
Different agrochemicals are associated with specific hazards. Eutrophication is often caused by the runoff of phosphorus from fertilizers. Biomagnification is a major concern with persistent pesticides like DDT. Methemoglobinemia can result from high nitrate levels in drinking water due to fertilizer leaching. Ozone depletion has been linked to the use of certain fumigants like methyl bromide in specialized agricultural applications.

151. (A) I, II and IV only
Trichoderma is a genus of beneficial fungi used as a biopesticide. It acts as an eco-friendly fungicide by competing with and destroying soil-borne pathogens. Beyond pest control, Trichoderma also enhances root development and improves soil health by promoting the decomposition of organic matter. Its production is encouraged through government-supported labs, providing farmers with a safe and effective alternative to synthetic chemicals.

152. (B) Complex water-insoluble fertilizers are preferred for fertigation systems.
Fertigation is an efficient method of applying nutrients by dissolving them into irrigation water. This allows for precise, targeted delivery of fertilizers directly to the plant root zone. For this system to function correctly without clogging, it is essential to use only highly water-soluble fertilizers. When done correctly, fertigation significantly improves nutrient use efficiency and reduces leaching losses compared to traditional broadcasting.

153. (A) Both A and R are true and R is the correct explanation of A.
The application of fertilizers requires a balanced approach to avoid nutrient antagonisms. For instance, excessively high levels of phosphorus in the soil, often from the over-application of DAP, can lead to zinc deficiency. This occurs because excess phosphorus can react with zinc to form insoluble zinc phosphate, which plants cannot absorb. Understanding these interactions is vital for effective and sustainable agricultural management.

154. (A) Reduce → Reuse → Recycle → Dispose
Effective plastic waste management follows a preferred hierarchy to minimize environmental impact. The most important step is to reduce overall consumption. Next, items should be reused as much as possible before they are discarded. For plastics that cannot be reused, recycling is the next priority. Finally, any remaining waste should be disposed of in a safe and regulated manner to protect ecosystems.

155. (A) Chemical bonds can be broken down by microbial enzymes.
The fundamental difference between a biodegradable and a non-biodegradable polymer lies in its susceptibility to biological breakdown. Biodegradable polymers are designed with chemical bonds that can be broken down by microbial enzymes into harmless natural substances. In contrast, non-biodegradable polymers have stable structures that resist natural action, leading to their persistence in the environment for centuries and creating significant long-term waste.

156. (B) Soaps - 100% Biodegradable
The environmental impact of cleansing agents depends on their chemical structure. Traditional soaps, made from natural fats and oils, are generally one hundred percent biodegradable and break down quickly in waterways. In contrast, many synthetic detergents are much more resistant to biodegradation. Persistent detergents can cause long-term foaming in rivers and disrupt aquatic life, leading to the development of more eco-friendly formulations.

157. (A) I, III and IV only
Safe handling of agrochemicals is essential to protect health and the environment. Farmers must use protective equipment and should always spray with the direction of the wind. Proper storage away from food is critical, and empty containers must be crushed and buried rather than reused. Pesticides should never be disposed of in water streams, as this causes widespread ecological contamination.

158. (A) Liquid fertilizers have longer shelf life and microbial survival.
In states like Tamil Nadu, there is an increasing shift toward liquid bio-fertilizers over traditional

Downloaded from www.pdf.tube

7. Which of the following pairs is incorrectly matched regarding the Five Kingdom classification?
(A) Monera - Bacillus anthracis
(B) Protista - Euglena
(C) Animalia - Sponges
(D) Fungi - Cyanobacteria
(E) Answer not known

8. Select the correct sequence of taxonomic categories in descending order.
(A) Kingdom, Phylum, Class, Order, Family, Genus, Species
(B) Kingdom, Class, Phylum, Order, Genus, Family, Species
(C) Species, Genus, Family, Order, Class, Phylum, Kingdom
(D) Kingdom, Phylum, Order, Class, Family, Species, Genus
(E) Answer not known

9. Identify the incorrect statement regarding the characteristics of living organisms.
(A) Biological growth in living organisms always occurs from the internal side.
(B) Reproduction is an all-inclusive defining feature of all living organisms.
(C) Cellular organization is a defining feature of all known life forms.
(D) Consciousness and response to stimuli are found in all living organisms.
(E) Answer not known

10. Consider the following statements about the rules of Binomial Nomenclature:
I. Biological names are generally in Latin and written in italics.
II. The first word in a biological name represents the genus while the second denotes the specific epithet.
III. Both words, when handwritten, are separately underlined.
IV. The specific epithet always starts with a capital letter.
Which of the above statements is/are correct?
(A) I, II and III
(B) II, III and IV
(C) I and IV
(D) II and IV
(E) Answer not known

11. Which of the following is not a recognized characteristic of Kingdom Fungi?
(A) They store food reserves as starch.
(B) They are achlorophyllous, heterotrophic organisms.
(C) Their cell walls are primarily composed of chitin and polysaccharides.
(D) They absorb soluble organic matter from dead substrates as saprophytes.
(E) Answer not known

12. Match the bacterial shapes in List I with their corresponding examples in List II:
List I: Bacterial Shapes
P. Coccus
Q. Bacillus
R. Vibrio
S. Spirillum
List II: Examples
I. Comma-shaped
II. Spiral-shaped
III. Spherical-shaped
IV. Rod-shaped
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-II, R-I, S-IV
(D) P-I, Q-IV, R-III, S-II
(E) Answer not known

NODIA

13. Consider the following phases of a standard bacterial growth curve. Arrange them in the correct sequential order:
I. Stationary phase
II. Lag phase
III. Decline or Death phase
IV. Log or Exponential phase
Which of the following represents the correct sequence?
(A) II - IV - I - III
(B) II - I - IV - III
(C) IV - II - I - III
(D) I - II - IV - III
(E) Answer not known

14. R.H. Whittaker's classification is primarily based on which of the following criteria?
(A) Presence of flagella and specific type of environmental habitat.
(B) Biochemical composition of cytoplasm and internal cell density.
(C) Cell structure, thallus organization, and

mode of nutrition.
(D) Mode of locomotion and complex social reproductive behavior.
(E) Answer not known

15. Which of the following pairs of bacteria and its significance is correctly matched?
(A) Lactobacillus - Commercial production of antibiotics.
(B) Rhizobium - Nitrogen fixation in leguminous plants.
(C) Clostridium tetani - Catalyzing the curdling of milk.
(D) Streptomyces - Pathogen that causes human tuberculosis.
(E) Answer not known

16. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Archaebacteria can survive in extreme environmental conditions such as hot springs and highly saline areas.
Reason (R): They have a unique cell wall structure that differs from other bacteria, providing resistance to extreme conditions.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

17. A key feature of cyanobacteria (blue-green algae) that distinguishes them from other Monerans is the presence of:
(A) Chlorophyll a molecules
(B) Chitinous cell wall layers
(C) True membrane-bound nucleus
(D) Multicellular tissue system
(E) Answer not known

18. Consider the following characteristics regarding living organisms:
I. Metabolism
II. Cellular organization
III. Consciousness
IV. Ability to self-replicate
V. Complete absence of entropy
Which of the above are true characteristics of life?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) I, IV and V
(E) Answer not known

19. What is the most appropriate definition of 'Species' in biological taxonomy?
(A) Organisms with similarities capable of interbreeding.
(B) A large group of organisms inhabiting the same geographical area regardless of reproduction.
(C) Organisms that belong to the same family and share analogous structures.
(D) A group of organisms sharing a common diet and habitat.
(E) Answer not known

20. Which of the following best represents the economic importance of bacteria in agriculture?
(A) They act as primary consumers in the terrestrial food web.
(B) They degrade atmospheric oxygen to ozone.
(C) They prevent the process of soil mineralization.
(D) They convert nitrogen into usable ammonia and nitrates.
(E) Answer not known

21. Protists are primarily defined as:
(A) Multicellular, heterotrophic prokaryotic organisms.
(B) Unicellular, predominantly aquatic eukaryotes.
(C) Multicellular autotrophs with vascular tissues.
(D) Acellular infectious chemical agents.
(E) Answer not known

22. Consider the following statements regarding Fungi:
I. Yeast is a unicellular fungus used in baking and brewing.
II. Penicillium is a multicellular fungus from which antibiotics are extracted.
III. All fungi are strictly parasitic and cause diseases in plants.
Which of the above statements is/are correct?

Click Here to Buy book on Amazon

(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

23. Which division of the Plant Kingdom is commonly known as the "amphibians of the plant kingdom"?
(A) Thallophyta
(B) Pteridophyta
(C) Gymnosperms
(D) Bryophyta
(E) Answer not known

24. Match the divisions of the Plant Kingdom in List I with their respective examples in List II:
List I: Plant Kingdom Divisions
P. Thallophyta
Q. Bryophyta
R. Pteridophyta
S. Gymnosperms
List II: Examples
I. Ferns
II. Cycas and Pinus
III. Spirogyra
IV. Riccia and Marchantia
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-I, Q-II, R-III, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

25. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Pteridophytes are known as the first terrestrial plants to possess vascular tissues.
Reason (R): They completely lack xylem and phloem in their stem structures.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

26. Identify the correct statement regarding Angiosperms.
(A) The seeds of angiosperms are naked and not enclosed in a fruit.
(B) Ovules are in an ovary that becomes a fruit.
(C) They are non-vascular plants reliant on water for fertilization.
(D) They do not exhibit double fertilization.
(E) Answer not known

27. Which of the following pairs of Invertebrate Phyla and its characteristic excretory organ is correctly matched?
(A) Platyhelminthes - Flame cells
(B) Annelida - Malpighian tubules
(C) Arthropoda - Nephridia
(D) Mollusca - Water vascular system
(E) Answer not known

28. Select the correct evolutionary sequence of major plant groups.
(A) Thallophyta, Bryophyta, Pteridophyta, Gymnosperms, Angiosperms
(B) Bryophyta, Thallophyta, Gymnosperms, Pteridophyta, Angiosperms
(C) Thallophyta, Pteridophyta, Bryophyta, Angiosperms, Gymnosperms
(D) Pteridophyta, Bryophyta, Thallophyta, Gymnosperms, Angiosperms
(E) Answer not known

29. Identify the incorrect statement concerning the animal kingdom classification.
(A) Animals are heterotrophic, multicellular eukaryotes lacking cell walls.
(B) Vertebrates possess a notochord at some stage of their life cycle.
(C) Sponges exhibit cellular level of organization.
(D) Invertebrates always have bilateral symmetry and coeloms.
(E) Answer not known

30. Consider the following statements about Phylum Arthropoda:
I. It is the largest phylum of Animalia.
II. They have jointed appendages.
III. Their body is covered by a chitinous exoskeleton.
IV. They possess a closed circulatory system.
Which of the above statements is/are correct?
(A) I, II and III
(B) I, III and IV

Downloaded from www.pdf.tube

CHAPTER 08

Life Science: Classification, Evolution and Genetics

1. The sum total of all the chemical reactions occurring in the body of a living organism is defined as:
(A) Metabolism
(B) Respiration
(C) Homeostasis
(D) Excretion
(E) Answer not known

2. Consider the following statements regarding the scope of life sciences:
I. Ecology deals with the interaction of organisms with their environment.
II. Histology is the study of tissues and their structures.
III. Mycology is the branch of biology that studies viruses.
Which of the above statements is/are correct?
(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

3. Who among the following is recognized as the Father of Taxonomy for introducing the system of binomial nomenclature?
(A) Carolus Linnaeus
(B) Aristotle of Stagira
(C) Theophrastus of Eresus
(D) Robert H. Whittaker
(E) Answer not known

4. Match the kingdoms in List I with their primary characteristics in List II:
List I: Kingdoms
P. Monera
Q. Protista
R. Fungi
S. Plantae
List II: Characteristics
I. Unicellular eukaryotes
II. Multicellular, autotrophic eukaryotes
III. Multicellular, heterotrophic eukaryotes with chitin cell wall
IV. Unicellular prokaryotes
(A) P-IV, Q-I, R-III, S-II
(B) P-I, Q-IV, R-II, S-III
(C) P-IV, Q-III, R-I, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

NODIA

5. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The scientific name of humans is written as Homo sapiens.
Reason (R): In binomial nomenclature, the generic name begins with a capital letter and the specific epithet begins with a small letter.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

6. Identify the correct statement regarding the Kingdom Monera.
(A) They possess a well-defined membrane-bound nucleus and organelles.
(B) All members of Monera reproduce exclusively by complex sexual means.
(C) They include bacteria and cyanobacteria lacking membrane organelles.
(D) Monerans are primarily multicellular organisms residing in extreme habitats.
(E) Answer not known

(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) I, IV and V
(E) Answer not known

39. Which of the following statements represents the most appropriate role of Protista in aquatic ecosystems?
(A) They act exclusively as benthic decomposers breaking down wood.
(B) They are the primary apex predators in freshwater lake systems.
(C) They regulate the thermal stratification of oceanic layers.
(D) Phytoplanktonic protists form the base of aquatic food webs.
(E) Answer not known

40. Sea anemone and corals belong to which category of invertebrates?
(A) Coelenterata (Cnidaria)
(B) Porifera
(C) Platyhelminthes
(D) Echinodermata
(E) Answer not known

41. The Cell Theory, which states that all living things are composed of cells, was originally formulated by:
(A) Antonie van Leeuwenhoek and Robert Hooke
(B) Matthias Schleiden and Theodor Schwann
(C) Rudolf Virchow and Robert Brown
(D) James Watson and Francis Crick
(E) Answer not known

42. Consider the following statements about mitochondria:
I. They are the powerhouses of the cell.
II. They possess a single membrane structure without invaginations.
III. They contain their own circular DNA and ribosomes.
Which of the above statements is/are correct?
(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

43. Who is credited with the discovery of the first virus, the Tobacco Mosaic Virus (TMV)?
(A) Dmitri Ivanovsky
(B) Louis Pasteur
(C) Robert Koch
(D) Edward Jenner
(E) Answer not known

44. Match the Vertebrate Classes in List I with their characteristic heart structures in List II:
List I: Vertebrate Classes
P. Pisces
Q. Amphibia
R. Reptilia (most)
S. Aves
List II: Heart Structures
I. Three-chambered heart with two atria and one ventricle
II. Two-chambered venous heart
III. Four-chambered heart
IV. Three-chambered heart with a partially divided ventricle
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-IV, R-II, S-I
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

45. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Viruses are considered obligate intracellular parasites.
Reason (R): Viruses lack cellular machinery and can only replicate inside a living host cell.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

46. Identify the correct statement comparing prokaryotic and eukaryotic cells.
(A) Eukaryotic cells lack membrane-bound organelles while prokaryotes have them.
(B) Prokaryotic cells undergo mitosis, while eukaryotic cells divide by binary fission.
(C) Prokaryotic cells have a nucleoid, whereas

Click Here to Buy book on Amazon

(C) Molecular biology
(D) Embryology
(E) Answer not known

78. Consider the following processes that can alter allele frequencies in a population:
I. Genetic drift
II. Gene flow
III. Mutation
IV. Non-random mating
V. Natural selection
Which of the above correctly form the combination of evolutionary forces in population genetics?
(A) I, II, III, IV and V
(B) II, III, IV and V
(C) I, III and V
(D) I, IV and V
(E) Answer not known

79. Which among the following is the most appropriate condition required for fossilization to occur?
(A) Immediate exposure to atmospheric oxygen and scavengers.
(B) Rapid burial to exclude oxygen and decay.
(C) Deposition in highly acidic volcanic lava.
(D) Prolonged exposure to sunlight and wind erosion.
(E) Answer not known

80. Comparing homologous and analogous structures, which statement is scientifically accurate?
(A) Homologous structures indicate convergent evolution, analogous indicate divergent evolution.
(B) Homologous structures have different anatomical origins but perform similar functions.
(C) Analogous structures share deep genetic and embryological similarities.
(D) Homologous structures indicate divergent evolution from a common ancestor.
(E) Answer not known

81. Vestigial organs are defined as:
(A) Non-functional organs functional in ancestors.
(B) Organs that have hypertrophied due to excessive use over generations.
(C) Organs that appear only during the embryonic stage and disappear entirely before birth.
(D) Highly evolved organs that perform multiple physiological functions in modern species.
(E) Answer not known

82. Consider the following statements about types of adaptations:
I. Hibernation is a behavioral adaptation to escape cold winter conditions.
II. Camouflage is a morphological adaptation for predator avoidance.
III. The presence of blubber in whales is purely an accidental mutation without adaptive value.
Which of the above statements is/are correct?
(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

83. Which experimental plant did Gregor Mendel use to formulate his laws of inheritance?
(A) Pisum sativum (Garden pea)
(B) Drosophila melanogaster (Fruit fly)
(C) Zea mays (Maize)
(D) Arabidopsis thaliana
(E) Answer not known

84. Match the stages of human evolution in List I with their estimated brain capacities in List II:
List I: Human Evolution Stages
P. Homo habilis
Q. Homo erectus
R. Neanderthal man
S. Australopithecus
List II: Brain Capacities
I. 900 cc
II. 650-800 cc
III. 1400 cc
IV. 400-500 cc
(A) P-II, Q-I, R-III, S-IV
(B) P-IV, Q-II, R-I, S-III
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

85. The following question consists of two statements — Assertion (A) and Reason (R).

NODIA

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

(C) Aves
(D) Mammalia
(E) Answer not known

55. Which of the following pairs of vertebrate groups and their primary respiratory organ is incorrectly matched?
(A) Pisces - Gills
(B) Reptilia - Lungs
(C) Aves - Lungs with air sacs
(D) Adult Amphibia - Gills exclusively
(E) Answer not known

56. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Lysosomes are often referred to as the 'suicidal bags' of the cell.
Reason (R): They contain powerful hydrolytic enzymes that can digest the cell's own damaged components.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

57. The internal membrane system of chloroplasts composed of flattened sac-like structures where light-dependent reactions of photosynthesis occur is known as:
(A) Stroma
(B) Thylakoids
(C) Matrix
(D) Cristae
(E) Answer not known

58. Consider the following statements about the significance of Meiosis:
I. It maintains the constant chromosome number across generations in sexually reproducing organisms.
II. It generates genetic variation through crossing over.
III. It results in four haploid daughter cells.
IV. It occurs in somatic cells during tissue repair.
V. It involves two sequential cycles of nuclear and cell division.
Which of the above statements is/are correct?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, III and IV
(D) I, IV and V
(E) Answer not known

59. What is the most appropriate description of the Rough Endoplasmic Reticulum (RER)?
(A) Membranes with ribosomes for protein synthesis.
(B) A network of tubules involved solely in lipid metabolism and detoxification.
(C) The primary site for the packaging of materials delivered to the cell membrane.
(D) The organelle responsible for storing starch in plant cells.
(E) Answer not known

60. Comparing mitosis and meiosis, which of the following is true?
(A) Mitosis involves two cellular divisions, whereas meiosis involves one.
(B) Crossing over occurs in anaphase of mitosis but not in meiosis.
(C) Mitosis produces genetically identical cells, while meiosis produces varied cells.
(D) Homologous chromosomes pair up at the metaphase plate in mitosis.
(E) Answer not known

61. Evolution in biological terms is best defined as:
(A) The immediate physiological adaptation of an organism to a sudden climate change.
(B) The life cycle changes from larva to adult in insects.
(C) The purposeful striving of an organism towards a perfect form.
(D) Descent with modification over successive generations.
(E) Answer not known

62. Consider the following principles of Lamarck's theory of evolution:
I. Internal vital force causes organisms to increase in size.
II. The inheritance of acquired characters.
III. Natural selection of the fittest phenotypes.
Which of the above form the correct combination of Lamarckian concepts?

Downloaded from www.pdf.tube

III. Cross-pollination
IV. Seed collection
Which of the following represents the correct sequence?
(A) I - II - III - IV
(B) II - I - IV - III
(C) I - III - II - IV
(D) III - I - II - IV
(E) Answer not known

109. Identify the incorrect statement regarding codominance.
(A) The F1 generation resembles both parents equally.
(B) The ABO blood group type AB is a classic example in humans.
(C) The alleles IA and IB produce their respective sugar polymers independently.
(D) A blending of traits creates intermediate phenotypes.
(E) Answer not known

110. Consider the following characteristics regarding Haemophilia:
I. It is an X-linked recessive disorder.
II. It is known as the "bleeder's disease" due to a defect in blood coagulation.
III. Females are more frequently affected than males.
IV. Queen Victoria was a known carrier of this disease.
Which of the above statements is/are correct?
(A) I, II and IV
(B) II, III and IV
(C) I and IV
(D) I and III
(E) Answer not known

111. Which of the following conditions does not represent multiple allelism?
(A) Human blood group ABO system
(B) Human skin colour controlled by three different genes
(C) Coat colour in rabbits
(D) Eye colour in Drosophila
(E) Answer not known

112. Match the genetic terms in List I with their definitions in List II:
List I: Genetic Terms
P. Homozygous
Q. Heterozygous
R. Phenotype
S. Genotype
List II: Definitions
I. Observable physical characteristics
II. Genetic constitution of an organism
III. Possessing two identical alleles for a trait
IV. Possessing two different alleles for a trait
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

113. Consider the following expected inheritance outcomes if a colour-blind male marries a normal homozygous female. Arrange the events in the correct tracing order:
I. Normal female produces ova with normal X.
II. Defective X is passed from father to daughters.
III. Daughters become carriers (heterozygous) but have normal vision.
IV. Carrier daughters pass the defective X to 50% of their sons in the next generation.
Which of the following represents the correct sequence?
(A) I - II - III - IV
(B) II - I - IV - III
(C) I - III - II - IV
(D) II - III - I - IV
(E) Answer not known

NODIA

114. A cross made between an F1 individual and its recessive parent to determine whether the F1 individual is homozygous or heterozygous is called a:
(A) Dihybrid cross
(B) Back cross
(C) Test cross
(D) Reciprocal cross
(E) Answer not known

115. Which of the following pairs of organisms and their sex-determination system is correctly matched?
(A) Grasshopper - XX (female) / XO (male)
(B) Humans - ZW (female) / ZZ (male)
(C) Birds - XX (female) / XY (male)
(D) Honeybees - Environmental sex determination

70. Consider the following factors associated with the Modern Synthetic Theory of Evolution:
I. Genetic mutations
II. Genetic recombination
III. Natural selection
IV. Reproductive isolation
Which of the above forces drive speciation in the modern theory?
(A) I, II, III and IV
(B) I, II and III
(C) II and IV
(D) I and IV
(E) Answer not known

71. Which of the following is not an example of analogous organs?
(A) Wings of a butterfly and wings of a bird
(B) Flippers of a penguin and flippers of a dolphin
(C) Eyes of an octopus and eyes of a mammal
(D) Forelimbs of a frog and forelimbs of a lizard
(E) Answer not known

72. Match the scientists in List I with their contributions to evolution in List II:
List I: Scientists
P. Lamarck
Q. Darwin
R. Hugo de Vries
S. T.R. Malthus
List II: Contributions
I. Mutation theory
II. Essay on the Principle of Population
III. Theory of inheritance of acquired characters
IV. Theory of natural selection
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-II, Q-I, R-IV, S-III
(D) P-III, Q-II, R-I, S-IV
(E) Answer not known

73. Consider the following postulates of Darwin's theory of Natural Selection. Arrange them in the correct logical sequence:
I. Struggle for existence
II. Overproduction (High reproductive capacity)
III. Survival of the fittest
IV. Variations among individuals
Which of the following represents the correct sequence?
(A) II - I - IV - III
(B) I - II - III - IV
(C) II - IV - I - III
(D) IV - I - II - III
(E) Answer not known

74. The concept of "Survival of the fittest" in the context of Darwinian evolution fundamentally refers to:
(A) Physical strength and size dominance in a population.
(B) Reproductive success in a given environment.
(C) The ability to withstand extreme physical damage.
(D) The organism that lives the longest lifespan.
(E) Answer not known

75. Which of the following pairs is incorrectly matched regarding evidence of evolution?
(A) Morphological evidence - Isotopic dating of rocks
(B) Paleontological evidence - Archaeopteryx
(C) Embryological evidence - Gill clefts in vertebrate embryos
(D) Molecular evidence - Cytochrome c protein sequences
(E) Answer not known

76. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Archaeopteryx is considered a connecting link between reptiles and birds.
Reason (R): It possessed reptilian features like a long tail and teeth, alongside avian features like feathers and wings.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

77. The evolutionary principle "Ontogeny recapitulates Phylogeny" was proposed by Ernst Haeckel based on observations in which field?
(A) Comparative anatomy
(B) Paleontology

Click Here to Buy book on Amazon

(A) P-IV, Q-II, R-I, S-III
(B) P-II, Q-I, R-III, S-IV
(C) P-III, Q-IV, R-II, S-I
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

93. Consider the following events of allopatric speciation. Arrange them in the correct sequence:
I. Accumulation of genetic differences (mutations/selection).
II. Division of a single population by a geographic barrier.
III. Reproductive isolation preventing interbreeding.
IV. Formation of two distinct species.
Which of the following represents the correct sequence?
(A) II - I - III - IV
(B) I - II - III - IV
(C) II - III - I - IV
(D) III - I - II - IV
(E) Answer not known

94. The Law of Segregation proposed by Mendel is based on the biological fact that:
(A) Genes on different chromosomes assert themselves independently.
(B) One allele is always dominant over another.
(C) Gene pairs separate during gametogenesis.
(D) Multiple genes control a single continuous phenotypic trait.
(E) Answer not known

95. Which of the following pairs of adaptation type and its example is incorrectly matched?
(A) Behavioral adaptation - Migration of birds
(B) Anatomical adaptation - Bird vocalizations (singing)
(C) Physiological adaptation - Kangaroo rat conserving water
(D) Morphological adaptation - Webbed feet in ducks
(E) Answer not known

96. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Mendel's law of independent assortment is easily observed in dihybrid crosses.
Reason (R): The segregation of one pair of traits occurs independently of another pair of traits during gamete formation.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

97. The distinguishing feature of Homo habilis compared to Australopithecus was:
(A) Definitive construction and use of stone tools.
(B) The development of an entirely modern human brain size.
(C) The first migration out of the African continent to Asia.
(D) The discovery and controlled use of fire for cooking.
(E) Answer not known

98. Consider the following anatomical trends during the evolution of modern man from ape-like ancestors:
I. Increase in cranial capacity
II. Flattening of the face (orthognathic)
III. Development of a distinct chin
IV. Loss of prominent brow ridges
V. Adoption of quadrupedal locomotion
Which of the above statements is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) I, IV and V
(E) Answer not known

99. The biological species concept defines a species primarily based on:
(A) Reproductive isolation from other such groups.
(B) Geographic isolation and physical distance.
(C) Morphological and structural similarities.
(D) Shared ecological niches.
(E) Answer not known

100. Streamlined body shape, presence of gills or blowholes, and fins/flippers are adaptations characteristic of which environment?
(A) Arboreal

NODIA

Answer the question by selecting the appropriate option.

Assertion (A): Allopatric speciation occurs when a population is split into two geographically isolated populations.

Reason (R): Geographic barriers prevent gene flow between the populations, allowing them to evolve independently into distinct species.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

86. Identify the correct statement regarding speciation.
(A) Speciation only occurs through the sudden mutation of a single individual.
(B) Interbreeding between two newly formed species always produces fertile offspring.
(C) Sympatric speciation lacks geographical isolation.
(D) Genetic drift prevents speciation by stabilizing the gene pool.
(E) Answer not known

87. Which of the following pairs of vestigial organs and its location/organism is correctly matched?
(A) Vermiform appendix - Human stomach
(B) Wisdom teeth - Front incisors in humans
(C) Hind limb bones - Modern birds
(D) Nictitating membrane - Human eye
(E) Answer not known

88. Consider the following stages of human evolution. Arrange them in the correct sequential order:
I. Australopithecus
II. Homo habilis
III. Homo erectus
IV. Neanderthal man
V. Homo sapiens
Which of the following represents the correct sequence?
(A) I - II - III - IV - V
(B) III - I - II - IV - V
(C) I - III - II - IV - V
(D) II - I - III - V - IV
(E) Answer not known

NODIA

89. Identify the incorrect statement concerning Mendel's laws of inheritance.
(A) The Law of Dominance states that in a heterozygote, one trait will conceal the presence of another trait for the same characteristic.
(B) Independent assortment holds for linked genes.
(C) The Law of Segregation is universally applicable without exceptions.
(D) Alleles separate randomly into gametes during meiosis.
(E) Answer not known

90. Consider the following adaptations observed in desert plants (xerophytes):
I. Leaves modified into spines.
II. Thick waxy cuticle on the epidermis.
III. Sunken stomata to reduce transpiration.
IV. Broad, thin leaves for maximum sunlight absorption.
Which of the above correctly form the combination of true xerophytic adaptations?
(A) I, II and III
(B) I, III and IV
(C) II and IV
(D) I and IV
(E) Answer not known

91. Which among the following is not considered a vestigial organ in humans?
(A) Epiglottis
(B) Ear muscles (auricular muscles)
(C) Coccyx (tailbone)
(D) Body hair
(E) Answer not known

92. Match the hominid ancestors in List I with their distinguishing features in List II:
List I: Hominid Ancestors
P. Australopithecus
Q. Homo habilis
R. Homo erectus
S. Neanderthal
List II: Distinguishing Features
I. First hominid known to use fire
II. First human-like being (handy man) using stone tools
III. Buried their dead with rituals
IV. Bipedal ape-man from East African grasslands

eukaryotes have a nucleus.
(D) Ribosomes in prokaryotes are of the 80S type, whereas in eukaryotes they are 70S.
(E) Answer not known

47. Which of the following pairs of cell organelle and its primary function is correctly matched?
(A) Ribosome - Lipid synthesis
(B) Lysosome - Intracellular digestion
(C) Smooth Endoplasmic Reticulum - Protein synthesis
(D) Golgi apparatus - Generation of ATP
(E) Answer not known

48. Consider the following stages of the cell cycle. Arrange them in the correct sequential order:
I. G1 phase
II. S phase
III. G2 phase
IV. M phase
Which of the following represents the correct sequence?
(A) I - II - III - IV
(B) II - I - IV - III
(C) IV - I - III - II
(D) III - II - I - IV
(E) Answer not known

49. Identify the incorrect statement regarding mitosis.
(A) It involves the pairing of homologous chromosomes and crossing over.
(B) It results in two daughter cells with the same number of chromosomes as the parent cell.
(C) It is essential for growth, repair, and replacement of cells in multicellular organisms.
(D) The nuclear envelope breaks down during prophase.
(E) Answer not known

50. Consider the following traits:
I. Presence of mammary glands
II. Four-chambered heart
III. Homoiothermous (warm-blooded) nature
IV. Presence of external ears (pinnae)
Which of the above are characteristic of Mammalia?
(A) I, II, III and IV
(B) I, II and III
(C) II and IV
(D) I and IV
(E) Answer not known

51. Which of the following diseases is not caused by a virus?
(A) Typhoid
(B) Poliomyelitis
(C) Rabies
(D) Dengue fever
(E) Answer not known

52. Match the types of viruses in List I with their specific characteristics or examples in List II:
List I: Virus Types
P. Bacteriophage
Q. Retrovirus
R. Adenovirus
S. TMV
List II: Characteristics/Examples
I. Possesses reverse transcriptase (e.g., HIV)
II. Infects bacteria
III. Rod-shaped plant virus
IV. Causes respiratory infections in humans
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-I, S-II
(D) P-II, Q-III, R-IV, S-I
(E) Answer not known

53. Consider the following substages of Prophase I in meiosis. Arrange them in the correct sequential order:
I. Pachytene
II. Leptotene
III. Diplotene
IV. Zygotene
Which of the following represents the correct sequence?
(A) II - IV - I - III
(B) I - II - III - IV
(C) IV - II - I - III
(D) II - I - IV - III
(E) Answer not known

54. The presence of pneumatic bones, a well-developed keel on the sternum, and lack of teeth are adaptive classification features found in which class?
(A) Amphibia
(B) Reptilia

Downloaded from www.pdf.tube

(B) Volant
(C) Fossorial
(D) Aquatic
(E) Answer not known

101. A genetic cross involving the simultaneous study of inheritance of two pairs of contrasting traits is known as a:
(A) Monohybrid cross
(B) Dihybrid cross
(C) Test cross
(D) Back cross
(E) Answer not known

102. Consider the following statements about incomplete dominance:
I. The F1 hybrid phenotype is intermediate between the two homozygous parents.
II. In Mirabilis jalapa (4 o'clock plant), crossing red and white flowers produces pink flowers.
III. Both alleles express themselves fully in the heterozygote without blending.
Which of the above statements is/are correct?
(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

103. The ABO blood group system in humans, demonstrating multiple allelism and codominance, was discovered by:
(A) Gregor Mendel
(B) Thomas Hunt Morgan
(C) William Harvey
(D) Karl Landsteiner
(E) Answer not known

104. Match the human ABO blood group genotypes in List I with their corresponding phenotypes in List II:
List I: Genotypes
P. IA IB
Q. ii
R. IA i
S. IB IB
List II: Phenotypes
I. Blood group O
II. Blood group AB
III. Blood group A
IV. Blood group B
(A) P-II, Q-I, R-III, S-IV
(B) P-I, Q-II, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-III, R-I, S-IV
(E) Answer not known

NODIA

105. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): In humans, the sex of the child is determined by the male parent.
Reason (R): Males are heterogametic, producing two types of sperms (one bearing X and the other bearing Y chromosome), while females produce only X-bearing ova.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

106. Identify the correct statement regarding sex-linked inheritance, specifically colour blindness.
(A) Colour blindness is a Y-linked dominant trait.
(B) It is common in males with one X chromosome.
(C) A carrier female and a normal male will have all colour-blind sons.
(D) Fathers directly pass the colour-blindness allele to their sons.
(E) Answer not known

107. Which of the following pairs of Mendelian crosses and their standard F2 phenotypic ratio is incorrectly matched?
(A) Test cross (Monohybrid) - 1:1
(B) Monohybrid cross - 3:1
(C) Dihybrid cross - 9:3:3:1
(D) Incomplete dominance (Monohybrid) - 1:2:1
(E) Answer not known

108. Consider the following steps involved in Mendel's experimental technique for hybridization. Arrange them in the correct sequence:
I. Emasculation
II. Bagging

(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

63. The seminal book "On the Origin of Species by Means of Natural Selection" was authored by:
(A) Jean-Baptiste Lamarck
(B) Charles Darwin
(C) Hugo de Vries
(D) Alfred Russel Wallace
(E) Answer not known

64. Match the evolutionary evidences in List I with their source fields in List II:
List I: Evolutionary Evidences
P. Fossil record
Q. Homologous organs
R. Ontogeny recapitulates phylogeny
S. DNA sequence similarity
List II: Source Fields
I. Molecular biology
II. Comparative anatomy
III. Embryology
IV. Paleontology
(A) P-IV, Q-II, R-III, S-I
(B) P-I, Q-II, R-IV, S-III
(C) P-III, Q-I, R-II, S-IV
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

65. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): According to Darwin, natural selection operates on variations that are beneficial to the organism in its specific environment.
Reason (R): Organisms with beneficial variations survive longer and leave more offspring, altering the population over time.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

66. Identify the correct statement regarding the Modern Synthetic Theory of evolution.
(A) It relies entirely on Lamarck's theory of use and disuse.
(B) It rejects the role of mutations in generating genetic diversity.
(C) It combines genetics, selection, and mutation.
(D) It postulates that evolution occurs only through large, sudden, singular macromutations.
(E) Answer not known

67. Which of the following pairs is correctly matched regarding evolutionary anatomy?
(A) Homologous organs - Forelimbs of whale, bat, and human
(B) Homologous organs - Bird wing and insect wing
(C) Analogous organs - Human arm and bat wing
(D) Analogous organs - Thorns of Bougainvillea and tendrils of Cucurbita
(E) Answer not known

68. Consider the following geological eras. Arrange them in the correct sequential order from oldest to most recent:
I. Paleozoic
II. Mesozoic
III. Cenozoic
Which of the following represents the correct sequence?
(A) I - II - III
(B) III - II - I
(C) II - I - III
(D) I - III - II
(E) Answer not known

69. Identify the incorrect statement regarding the limitations of Darwin's theory.
(A) Darwin could not accurately explain the mechanism of inheritance of variations.
(B) Darwin completely rejected the concept of overproduction of offspring.
(C) Darwin overemphasized the role of small fluctuating variations.
(D) Darwin failed to distinguish between somatic and germinal variations.
(E) Answer not known

Click Here to Buy book on Amazon

(E) Answer not known

116. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Persons with blood group O are called universal donors.
Reason (R): Their red blood cells lack both A and B antigens, thus preventing agglutination when transfused into any recipient.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

117. In the human XY sex determination system, the key gene on the Y chromosome responsible for initiating male development is the:
(A) BRCA gene
(B) SRY gene
(C) CFTR gene
(D) HOX gene
(E) Answer not known

118. Consider the following statements about the ABO blood group system:
I. It is controlled by a single gene denoted as 'I'.
II. Alleles IA and IB are completely dominant over allele i.
III. IA and IB are codominant when present together.
IV. A person with genotype IAi has blood group A.
V. It demonstrates polygenic inheritance.
Which of the above statements is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) I, IV and V
(E) Answer not known

119. In sex-linked recessive inheritance, why are carrier females usually phenotypically normal?
(A) The recessive allele converts itself into a dominant allele in females.
(B) The Y chromosome provides a compensatory normal gene.
(C) Recessive traits are never expressed in mammalian females.
(D) A dominant allele on the other X masks the trait.
(E) Answer not known

120. When comparing dominance and incomplete dominance, the crucial difference lies in the fact that:
(A) In dominance, the heterozygote matches one parent; in incomplete, it is a blend.
(B) Incomplete dominance violates Mendel's Law of Segregation.
(C) Dominance only involves multiple alleles while incomplete dominance does not.
(D) Incomplete dominance occurs only in dihybrid crosses.
(E) Answer not known

NODIA

121. A gene is best defined as:
(A) The entire set of DNA contained within a cell nucleus.
(B) A DNA sequence coding for a protein or RNA product.
(C) The protein structure that forms the centromere of a chromosome.
(D) A lipid molecule responsible for transmitting hereditary information.
(E) Answer not known

122. Consider the following statements about the DNA double helix model:
I. It was proposed by James Watson and Francis Crick.
II. The two polynucleotide chains are antiparallel to each other.
III. Adenine pairs with Cytosine via three hydrogen bonds.
Which of the above statements is/are correct?
(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

123. The foundational X-ray diffraction data that led to the discovery of the DNA double helix structure was produced by:
(A) Rosalind Franklin and Maurice Wilkins
(B) Gregor Mendel

donor.
III. Fusion of the nucleus with an enucleated egg cell using an electric shock.
IV. Removal of the nucleus from an unfertilized egg cell.
Which of the following represents the correct sequence?
(A) II - IV - III - I
(B) IV - II - I - III
(C) II - III - IV - I
(D) IV - III - II - I
(E) Answer not known

154. Chemical or physical agents that induce mutations in DNA are generally termed:
(A) Vectors
(B) Mutagens
(C) Promoters
(D) Repressors
(E) Answer not known

155. Which of the following pairs of Genetically Modified (GM) crop and its engineered trait is incorrectly matched?
(A) Bt Brinjal - Herbicide tolerance
(B) Golden Rice - Vitamin A enrichment
(C) Flavr Savr Tomato - Increased shelf life
(D) Bt Cotton - Insect resistance
(E) Answer not known

156. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Reproductive cloning of humans is widely banned globally due to profound ethical and health concerns.
Reason (R): Cloning procedures often result in high failure rates, developmental abnormalities, and raise moral issues regarding human dignity.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

157. A type of mutation where a single nucleotide base is changed, inserted, or deleted from a DNA sequence is known as a:
(A) Frameshift mutation only
(B) Chromosomal translocation
(C) Polyploidy
(D) Point mutation
(E) Answer not known

158. Consider the following applications of genetic engineering:
I. Production of recombinant vaccines (e.g., Hepatitis B vaccine).
II. Bioremediation using genetically engineered microbes.
III. Gene therapy for hereditary diseases.
IV. Creating plants with resistance to abiotic stresses like drought.
V. Classical traditional hybridization of crop plants.
Which of the above correctly form the combination of true genetic engineering applications?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) I, IV and V
(E) Answer not known

159. What is the most appropriate reason why somatic cell gene therapy is currently favored over germline gene therapy in clinical settings?
(A) Somatic cell therapy guarantees a cure for all descendants.
(B) It limits modification to individuals only.
(C) Germline gene therapy is significantly cheaper and easier to perform.
(D) Somatic cells are immortal and do not undergo apoptosis.
(E) Answer not known

160. Plasmids are frequently used as cloning vectors in biotechnology. Which of the following best categorizes a plasmid?
(A) Protective viral protein coat for genomes.
(B) A cellular organelle responsible for protein synthesis.
(C) An enzyme that restricts the growth of bacteriophages.
(D) Circular, extrachromosomal DNA molecules.
(E) Answer not known

Downloaded from www.pdf.tube

131. Which of the following structures or molecules is not directly involved in the process of translation?
(A) RNA Polymerase
(B) Ribosome
(C) mRNA
(D) tRNA
(E) Answer not known

132. Match the features of the genetic code in List I with their meanings in List II:
List I: Genetic Code Features
P. Degenerate
Q. Universal
R. Non-overlapping
S. Unambiguous
List II: Meanings
I. Each codon codes for only one specific amino acid
II. Some amino acids are coded by more than one codon
III. The same code applies to almost all living organisms
IV. Adjacent codons do not share bases
(A) P-II, Q-III, R-IV, S-I
(B) P-I, Q-IV, R-II, S-III
(C) P-IV, Q-II, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

133. Consider the following steps of protein synthesis (translation). Arrange them in the correct sequential order:
I. Elongation of the polypeptide chain
II. Binding of mRNA to the smaller subunit of the ribosome
III. Termination at the stop codon
IV. Attachment of initiator tRNA to the start codon
Which of the following represents the correct sequence?
(A) II - IV - I - III
(B) IV - II - I - III
(C) II - I - IV - III
(D) I - II - III - IV
(E) Answer not known

134. Erwin Chargaff's rules regarding DNA base pairing state that:
(A) The number of purines is always twice the number of pyrimidines.
(B) Adenine pairs with Guanine and Cytosine pairs with Thymine.
(C) A:T and G:C ratios are constant and equal one.
(D) RNA has the same base composition as the DNA template.
(E) Answer not known

135. Which of the following pairs is correctly matched?
(A) UAA, UAG, UGA - Start codons
(B) AUG - Stop codon
(C) Anticodon loop - Present on mRNA
(D) Promoter - Binding site for RNA polymerase
(E) Answer not known

136. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): In eukaryotes, the initial RNA transcript (hnRNA) undergoes splicing before translation.
Reason (R): Splicing is required to remove non-coding sequences (introns) and join coding sequences (exons) together.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

137. Chromosomes consist of DNA tightly coiled around specific basic proteins called:
(A) Globulins
(B) Histones
(C) Albumins
(D) Keratins
(E) Answer not known

138. Consider the following enzymes and their functions during DNA replication:
I. Topoisomerase relieves supercoiling tension.
II. DNA Helicase unwinds the double helix.
III. RNA Primase synthesizes RNA primers.
IV. DNA Polymerase III adds nucleotides continuously to the leading strand.
V. DNA Ligase cuts the DNA to prevent over-twisting.

Which of the above statements is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) I, IV and V
(E) Answer not known

139. What is the most appropriate description of the function of transfer RNA (tRNA) in a cell?
(A) An adapter matching specific amino acids to mRNA.
(B) It provides the genetic blueprint for synthesizing proteins.
(C) It acts as a structural scaffold for the ribosome.
(D) It regulates the transcription of DNA into mRNA.
(E) Answer not known

140. A nucleotide, the basic building block of DNA, is composed of which of the following three components?
(A) A nitrogenous base, a hexose sugar, and a sulfate group.
(B) An amino acid, a pentose sugar, and a phosphate group.
(C) A nitrogenous base, a pentose sugar, and a phosphate group.
(D) A purine, a pyrimidine, and a hydrogen bond.
(E) Answer not known

141. Mutation is best defined as:
(A) The natural physiological aging process of cellular DNA.
(B) The process of crossing over during prophase I of meiosis.
(C) The predictable acclimatization of an organism to a new habitat.
(D) Inheritable alteration in the DNA sequence.
(E) Answer not known

142. Consider the following clinical features regarding Down syndrome:
I. It is caused by Trisomy of chromosome 21.
II. Affected individuals typically have a broad flat face and characteristic palm crease.
III. It is a sex-linked genetic disorder.
Which of the above statements is/are correct?
(A) I and II
(B) I and III
(C) II
(D) III
(E) Answer not known

143. Who successfully cloned the first mammal, Dolly the sheep, from an adult somatic cell?
(A) Craig Venter
(B) Ian Wilmut
(C) Kary Mullis
(D) Frederick Sanger
(E) Answer not known

144. Match the genetic disorders in List I with their corresponding chromosomal karyotypes in List II:
List I: Genetic Disorders
P. Down syndrome
Q. Turner syndrome
R. Klinefelter syndrome
S. Normal male
List II: Karyotypes
I. 44 Autosomes + XXY
II. 45 Autosomes + XX or XY (Trisomy 21)
III. 44 Autosomes + XY
IV. 44 Autosomes + XO
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-I, S-III
(C) P-I, Q-IV, R-II, S-III
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

145. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Transgenic animals possess foreign DNA integrated into their genome.
Reason (R): Genetic engineering tools are used to insert desired genes into their embryos to study gene function, disease models, or produce biological products.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

146. Identify the correct statement regarding tools used in Genetic Engineering.

Click Here to Buy book on Amazon

(A) Restriction endonucleases synthesize new DNA strands by adding nucleotides.
(B) DNA Ligase is known as the "molecular scissors" because it cuts DNA at specific sites.
(C) Plasmids are circular DNA used as vectors.
(D) PCR (Polymerase Chain Reaction) is used to translate RNA into protein.
(E) Answer not known

147. Which of the following pairs of restriction enzyme and its source bacterium is correctly matched?
(A) EcoRI - Escherichia coli
(B) HindIII - Staphylococcus aureus
(C) BamHI - Bacillus subtilis
(D) Taq polymerase - Agrobacterium tumefaciens
(E) Answer not known

148. Consider the following steps in creating recombinant DNA. Arrange them in the correct sequential order:
I. Isolation of DNA
II. Cutting with restriction enzyme
III. Ligation into vector
IV. Transfer into host
Which of the following represents the correct sequence?
(A) I - II - III - IV
(B) IV - III - I - II
(C) II - I - IV - III
(D) III - I - II - IV
(E) Answer not known

149. Identify the incorrect statement regarding gene therapy.
(A) It involves the introduction of a normal functional gene into a patient's cells to replace or compensate for a defective gene.
(B) Somatic therapy is passed on to offspring.
(C) Viral vectors are often used to deliver the therapeutic gene into the target cells.
(D) The first clinical gene therapy was given to a girl suffering from ADA deficiency.
(E) Answer not known

150. Consider the following statements comparing Turner syndrome and Klinefelter syndrome:
I. Turner syndrome results from an absence of one X chromosome (45, XO).
II. Klinefelter syndrome results from the presence of an extra X chromosome in males (47, XXY).
III. Individuals with Turner syndrome are sterile females.
IV. Individuals with Klinefelter syndrome are normal fertile males.
Which of the above correctly form the combination of true statements?
(A) I, II and III
(B) I, II and IV
(C) II and IV
(D) I and IV
(E) Answer not known

151. Which among the following is not an application of biotechnology?
(A) Production of genetically modified (GM) crops like Bt cotton.
(B) Production of human insulin using recombinant DNA technology.
(C) Development of transgenic animals for medical research.
(D) Traditional selective natural cross-breeding.
(E) Answer not known

152. Match the biotechnology products in List I with their specific applications in List II:
List I: Biotechnology Products
P. Golden Rice
Q. Bt Cotton
R. Humulin
S. Flavr Savr Tomato
List II: Applications
I. Delayed ripening
II. Genetically engineered human insulin
III. Enriched with Vitamin A (beta-carotene)
IV. Pest-resistant crop
(A) P-III, Q-IV, R-II, S-I
(B) P-IV, Q-III, R-I, S-II
(C) P-I, Q-II, R-IV, S-III
(D) P-III, Q-II, R-IV, S-I
(E) Answer not known

153. Consider the following steps involved in the somatic cell nuclear transfer (SCNT) cloning of Dolly the sheep. Arrange them in the correct sequence:
I. Implantation of the embryo into a surrogate mother.
II. Isolation of a somatic cell nucleus from the

Downloaded from www.pdf.tube

(C) Frederick Griffith
(D) Hershey and Chase
(E) Answer not known

124. Match the types of RNA in List I with their respective roles in List II:
List I: Types of RNA
P. mRNA
Q. tRNA
R. rRNA
S. snRNA
List II: Roles
I. Carries amino acids to the ribosome
II. Forms the structural component of ribosomes
III. Carries the genetic message from DNA to the ribosome
IV. Involved in splicing of pre-mRNA
(A) P-III, Q-I, R-II, S-IV
(B) P-I, Q-III, R-II, S-IV
(C) P-III, Q-II, R-I, S-IV
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

125. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): DNA replication is termed semi-conservative.
Reason (R): After replication, each new DNA double helix consists of one original parental strand and one newly synthesized strand.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

126. Identify the correct statement regarding transcription.
(A) Transcription is the process of synthesizing a protein from an mRNA template.
(B) The primary enzyme required for transcription is DNA polymerase.
(C) Only one DNA strand acts as an RNA template.
(D) Transcription occurs in the cytoplasm of eukaryotic cells.
(E) Answer not known

127. Which of the following pairs of enzyme and its role in DNA replication is incorrectly matched?
(A) Helicase - Unwinds the DNA double helix
(B) Primase - Adds methyl groups to DNA bases
(C) DNA Polymerase - Synthesizes the new DNA strand
(D) Ligase - Joins Okazaki fragments
(E) Answer not known

128. Select the correct sequence that represents the Central Dogma of molecular biology.
(A) RNA → DNA → Protein
(B) DNA → RNA → Protein
(C) Protein → RNA → DNA
(D) DNA → Protein → RNA
(E) Answer not known

129. Identify the incorrect statement regarding the process of translation.
(A) Translation synthesizes DNA from an RNA template.
(B) Translation occurs on the ribosomes.
(C) Transfer RNA (tRNA) acts as an adapter molecule reading the codon.
(D) The process is initiated by the start codon AUG, which codes for Methionine.
(E) Answer not known

NODIA

130. Consider the following differences between DNA and RNA:
I. DNA contains deoxyribose sugar, while RNA contains ribose sugar.
II. DNA is predominantly double-stranded, whereas RNA is predominantly single-stranded.
III. DNA uses Uracil as a base, while RNA uses Thymine.
IV. DNA is highly stable, whereas RNA is relatively unstable and easily degraded.
Which of the above correctly form the combination of valid differences?
(A) I, II and IV
(B) II, III and IV
(C) I and IV
(D) I and III
(E) Answer not known

ANSWERS

1. (A) Metabolism
Metabolism encompasses the complex network of all chemical transformations that take place within the cells of a living organism. These reactions are essential for maintaining life, providing energy for cellular processes, and facilitating the synthesis of new organic molecules. It involves two main pathways: catabolism, which breaks down molecules, and anabolism, which builds them.

2. (A) I and II
Ecology is the scientific study of how organisms interact with each other and their surrounding environment. Histology focuses on the microscopic structure of tissues and their specific biological functions. While these fields are correctly described, mycology actually pertains to the study of fungi rather than viruses, which are studied under the specific branch known as virology.

3. (A) Carolus Linnaeus
Carolus Linnaeus was a Swedish botanist who established the modern system of biological classification. He is widely honored as the Father of Taxonomy for introducing binomial nomenclature, which assigns every organism a two-part scientific name. This standardized system provides a universal language for scientists globally, ensuring clarity and consistency when identifying and categorizing diverse life forms.

4. (A) P-IV, Q-I, R-III, S-II
Biological classification organizes life based on fundamental cellular characteristics. Monerans are unicellular prokaryotes, while protists are unicellular eukaryotes. Fungi are multicellular heterotrophs with chitinous cell walls, and plants are multicellular autotrophs that perform photosynthesis. This systematic arrangement highlights the diversity of life, ranging from simple bacterial structures to complex organisms like plants and fungi with specialized tissues.

5. (A) Both A and R are true and R is the correct explanation of A.
In biological nomenclature, every species is identified by a two-part scientific name. The first part, the generic name, always begins with a capital letter, while the specific epithet begins with a small letter. The name Homo sapiens follows these specific rules of nomenclature, where the genus is capitalized and the species identifier is kept in lowercase.

6. (C) They include bacteria and cyanobacteria lacking membrane organelles.
Kingdom Monera comprises the most primitive organisms, which are primarily unicellular and prokaryotic in nature. These organisms, such as bacteria and blue-green algae, lack a defined nucleus and membrane-bound organelles like mitochondria or chloroplasts. Their genetic material is typically contained in a nucleoid region, and they are capable of thriving in diverse and often extreme environmental conditions.

7. (D) Fungi - Cyanobacteria
In the Five Kingdom classification system, organisms are grouped based on cell type and nutritional mode. Cyanobacteria are prokaryotic organisms that perform photosynthesis and belong to Kingdom Monera. They are not part of Kingdom Fungi, which consists of eukaryotic, heterotrophic organisms with chitinous cell walls. This distinction is vital for understanding the fundamental differences between prokaryotic and eukaryotic life.

8. (A) Kingdom, Phylum, Class, Order, Family, Genus, Species
Taxonomic hierarchy organizes living organisms into progressively more specific categories. The classification begins with the broadest group, the Kingdom, and moves through Phylum, Class, Order, Family, and Genus, finally reaching the most specific level, the Species. This descending order helps scientists systematically group organisms based on shared physical characteristics, evolutionary history, and genetic similarities found across all life.

Click Here to Buy book on Amazon

the developing seeds. This group also exhibits a specialized process called double fertilization. Unlike gymnosperms, which have naked seeds, angiosperms are highly evolved vascular plants that dominate most terrestrial ecosystems due to these sophisticated reproductive adaptations.

27. (A) Platyhelminthes - Flame cells
Different invertebrate phyla have evolved specialized organs for excretion and osmoregulation. Platyhelminthes, or flatworms, utilize flame cells to remove waste. Annelids use nephridia, while arthropods often possess Malpighian tubules or green glands. Molluscs typically have organ systems like the kidney or Bojanus organ. Identifying these specific matches is essential for understanding the physiological diversity and evolutionary complexity within the animal kingdom.

28. (A) Thallophyta, Bryophyta, Pteridophyta, Gymnosperms, Angiosperms
The evolutionary history of plants shows a clear progression from simple aquatic forms to complex terrestrial organisms. It began with Thallophyta (algae), followed by Bryophyta (mosses). Next came Pteridophyta, the first vascular plants. Gymnosperms introduced seed production without flowers, and finally, Angiosperms evolved with flowers and seeds enclosed in fruits. This sequence represents increasing adaptation to life on land and reproductive efficiency.

29. (D) Invertebrates always have bilateral symmetry and coeloms.
The animal kingdom is incredibly diverse, and invertebrates do not share a single uniform body plan. While many exhibit bilateral symmetry and possess coeloms, others like sponges have no symmetry (asymmetrical), and cnidarians show radial symmetry. Furthermore, many invertebrates are acoelomate or pseudocoelomate. Understanding these variations in symmetry and body cavities is fundamental to the accurate classification of the different invertebrate phyla.

30. (A) I, II and III
Phylum Arthropoda is the largest group in the animal kingdom, encompassing over two-thirds of all named species. These animals are characterized by jointed appendages and a tough exoskeleton made of chitin that protects their bodies. However, unlike mammals or annelids, arthropods possess an open circulatory system where blood flows into open spaces called sinuses rather than through a closed network.

31. (B) They must undergo ecdysis or moulting to grow in size.
Molluscs are typically soft-bodied animals that are bilaterally symmetrical and triploblastic. Their body is unsegmented and usually consists of a head, visceral mass, and a muscular foot. A mantle covers the visceral hump and often secretes a protective shell. Unlike arthropods, which must undergo ecdysis or moulting to grow by shedding their rigid exoskeleton, molluscs generally enlarge their shells continuously.

32. (A) P-IV, Q-I, R-II, S-III
Fungi have diverse roles in human industry, agriculture, and ecology. Saccharomyces cerevisiae is essential for baking, while Puccinia graminis causes significant crop damage like wheat rust. Trichoderma is utilized as a biological control agent against plant pathogens. Agaricus bisporus is the common edible mushroom found globally. These examples demonstrate how different fungal species can be beneficial or harmful depending on their context.

NODIA

33. (A) I - IV - III - II
Invertebrate evolution shows a clear trend of increasing organizational complexity. Sponges (Porifera) have the simplest cellular level of organization. Coelenterates introduce tissues and radial symmetry. Flatworms (Platyhelminthes) represent the first group with organ-level organization and bilateral symmetry. Annelids are more advanced, featuring true segmentation, a coelom, and a closed circulatory system. This sequence highlights the progressive development of specialized biological systems.

34. (C) Echinodermata
Radial symmetry is a body plan where parts are arranged around a central axis, often seen in aquatic organisms. While most advanced animals exhibit bilateral symmetry, adult echinoderms, such as starfish and sea urchins, are uniquely characterized by pentamerous radial symmetry. Interestingly, their larvae are bilaterally symmetrical, showing that this radial

different pigments or methods to obtain energy from their environment.

18. (A) I, II, III and IV
Living organisms are characterized by several fundamental biological properties. These include metabolism for energy processing, cellular organization as the structural basis of life, consciousness to respond to external stimuli, and the ability to self-replicate through reproduction. While life strives for internal order, it does not involve the complete absence of entropy, as all physical systems are subject to thermodynamic laws.

19. (A) Organisms with similarities capable of interbreeding.
In biological taxonomy, a species is defined as a group of organisms that share fundamental structural and functional similarities. Most importantly, members of a species are capable of interbreeding under natural conditions to produce fertile offspring. This reproductive isolation from other groups ensures that the species remains a distinct evolutionary unit, maintaining its unique genetic identity over successive generations of life.

20. (D) They convert nitrogen into usable ammonia and nitrates.
Bacteria play a crucial role in agriculture by enhancing soil fertility through the process of nitrogen fixation. Certain bacteria live in the soil or in symbiotic relationships with plant roots, converting atmospheric nitrogen into forms like ammonia and nitrates. Since plants cannot utilize atmospheric nitrogen directly, these bacterial activities are essential for providing the nutrients necessary for healthy crop growth.

21. (B) Unicellular, predominantly aquatic eukaryotes.
Kingdom Protista includes a diverse group of eukaryotic organisms that are primarily unicellular and typically found in aquatic environments. Unlike monerans, protists have a well-defined nucleus and membrane-bound organelles. This kingdom serves as a taxonomic link between the simpler prokaryotic monerans and more complex multicellular eukaryotes, encompassing organisms like amoebae, algae, and various protozoans with different modes of nutrition.

22. (A) I and II
Yeast is a crucial unicellular fungus used extensively in the baking and brewing industries due to its fermentation capabilities. Penicillium is a multicellular fungus famous for being the original source of the antibiotic penicillin. While some fungi are parasitic and cause diseases, many others are saprophytic decomposers or form beneficial symbiotic relationships, meaning they are not all strictly harmful to plants.

23. (D) Bryophyta
Bryophytes are often called the amphibians of the plant kingdom because they occupy a transitional position between aquatic and terrestrial life. Although they live on land, they are heavily dependent on water for sexual reproduction, as their sperm require a film of moisture to swim to the egg. This group includes mosses and liverworts, which lack specialized vascular tissues for water transport.

24. (A) P-III, Q-IV, R-I, S-II
The plant kingdom is divided into several groups based on their structural complexity. Thallophytes like Spirogyra have simple bodies, while bryophytes like Riccia represent primitive land plants. Pteridophytes, including ferns, were the first to develop vascular tissues. Gymnosperms like Cycas produce seeds that are not enclosed in fruits. Each group reflects an evolutionary stage in the transition from water to land.

25. (C) A is true but R is false.
Pteridophytes are evolutionary significant as the first terrestrial plants to develop vascular tissues, specifically xylem and phloem. These tissues allow for the efficient transport of water and nutrients throughout the plant body, enabling them to grow larger than bryophytes. Therefore, the assertion that they possess vascular tissues is correct, but the claim that they lack these structures is scientifically inaccurate.

26. (B) Ovules are in an ovary that becomes a fruit.
Angiosperms are flowering plants characterized by several unique reproductive features. Their ovules are enclosed within an ovary, which matures into a fruit after fertilization, protecting

Downloaded from www.pdf.tube

9. (B) Reproduction is an all-inclusive defining feature of all living organisms.
While reproduction is a fundamental biological process, it cannot be considered an all-inclusive defining feature of all living things. Many living organisms, such as mules, sterile worker bees, and certain infertile human couples, are incapable of reproducing despite being alive. Therefore, features like metabolism, cellular organization, and consciousness are more reliable defining characteristics for identifying living organisms in biology.

10. (A) I, II and III
Binomial nomenclature follows strict international rules to ensure scientific consistency. Biological names are usually derived from Latin and are printed in italics. The first word identifies the genus, while the second indicates the specific species. When handwritten, both names must be underlined separately. The specific epithet must always begin with a small letter, not a capital letter.

11. (A) They store food reserves as starch.
Fungi are unique eukaryotic organisms that are heterotrophic and lack chlorophyll, meaning they cannot perform photosynthesis. Unlike plants, which store energy as starch, fungi store their food reserves primarily in the form of glycogen and oil droplets. Their cell walls are mainly composed of chitin, and they obtain nutrients by absorbing organic matter from their immediate surrounding environment.

12. (A) P-III, Q-IV, R-I, S-II
Bacteria are classified based on their distinct morphological shapes. Coccus bacteria are spherical, while bacillus forms are rod-shaped. Vibrio bacteria are characterized by a comma-like appearance, and spirillum bacteria exhibit a spiral or corkscrew structure. Identifying these shapes is a fundamental step in microbiology, as it helps in the classification, study, and diagnosis of various bacterial species and infections.

13. (A) II - IV - I - III
A standard bacterial growth curve follows a predictable four-phase sequence. It begins with the lag phase, where bacteria acclimate to their environment. This is followed by the log phase, characterized by rapid exponential growth. Next is the stationary phase, where growth rates equal death rates. Finally, the decline phase occurs as nutrients are depleted and toxic waste products accumulate.

14. (C) Cell structure, thallus organization, and mode of nutrition.
R.H. Whittaker proposed the Five Kingdom classification based on several critical biological criteria. These included the complexity of cell structure, such as whether organisms are prokaryotic or eukaryotic, and the level of body organization. Most importantly, the mode of nutrition, whether autotrophic, saprophytic, or ingestive, played a central role in distinguishing between the kingdoms of Monera, Protista, Fungi, Plantae, and Animalia.

15. (B) Rhizobium - Nitrogen fixation in leguminous plants.
Rhizobium is a genus of bacteria that forms a symbiotic relationship with the roots of leguminous plants. These bacteria are capable of converting atmospheric nitrogen into ammonia, which the plants can then use for growth. This biological nitrogen fixation is essential for maintaining soil fertility and supporting agricultural productivity, making these bacteria highly significant in both ecology and sustainable farming.

16. (A) Both A and R are true and R is the correct explanation of A.
Archaebacteria are ancient organisms capable of flourishing in the most extreme environments on Earth, such as hydrothermal vents and hypersaline lakes. Their survival is primarily attributed to their unique cell wall composition and membrane lipids, which are more stable and resistant to harsh conditions than those of other bacteria. This structural difference allows them to maintain cellular integrity under intense stress.

17. (A) Chlorophyll a molecules
Cyanobacteria, also known as blue-green algae, are unique among monerans because they possess chlorophyll a, similar to green plants. This allows them to perform oxygenic photosynthesis, converting light energy into chemical energy while releasing oxygen into the atmosphere. This specific photosynthetic pigment distinguishes them from other bacteria, which may use

NODIA

arrangement is a secondary adaptation to their specific marine and often sedentary lifestyles.

35. (A) Aschelminthes - Calcareous ossicles
Each animal phylum has distinctive morphological features used for classification. Porifera are identified by choanocytes, while coelenterates have cnidoblasts for defense. Ctenophores possess comb plates for locomotion. Calcareous ossicles are actually a characteristic feature of the endoskeleton in Echinodermata, not Aschelminthes. Aschelminthes, or roundworms, are primarily recognized by their pseudocoelomate body structure and smooth, unsegmented, cylindrical bodies.

36. (A) Both A and R are true and R is the correct explanation of A.
Fungi are essential decomposers that recycle nutrients within ecosystems. They achieve this by secreting powerful digestive enzymes onto dead organic matter, breaking down complex molecules like cellulose and lignin into simpler inorganic substances. These nutrients are then absorbed by the fungi and made available to other organisms. This external digestion process is fundamental to the maintenance of soil health and nutrient cycling.

37. (B) Echinodermata
The water vascular system is a unique and defining feature of the phylum Echinodermata. This network of fluid-filled canals operates through hydraulic pressure, facilitating various essential functions such as locomotion via tube feet, the capture and transport of food, and gaseous exchange for respiration. No other animal phylum possesses this specific physiological system, making it a critical diagnostic trait for identifying echinoderms.

38. (A) I, II, III and IV
Gymnosperms are vascular plants characterized by the production of "naked" seeds, which are not enclosed within an ovary or fruit. They possess true roots, stems, and leaves, and their life cycle is dominated by the sporophytic generation. Unlike angiosperms, gymnosperms do not produce flowers; instead, they usually bear cones. These adaptations allowed them to thrive in various terrestrial environments long before flowering plants evolved.

39. (D) Phytoplanktonic protists form the base of aquatic food webs.
Protists play a vital ecological role as the primary producers in aquatic environments. Phytoplanktonic protists, such as diatoms and dinoflagellates, perform photosynthesis and generate a significant portion of the Earth's oxygen. By converting solar energy into organic matter, they form the essential base of the aquatic food web, supporting a vast array of marine and freshwater organisms from tiny zooplankton to large whales.

40. (A) Coelenterata (Cnidaria)
Sea anemones and corals are members of the phylum Coelenterata, also known as Cnidaria. These marine organisms are characterized by radial symmetry and the presence of specialized stinging cells called cnidocytes. They often exist in two body forms: the sessile polyp, like corals and anemones, and the free-swimming medusa. Corals are particularly significant for building massive reef structures that support diverse marine life.

41. (B) Matthias Schleiden and Theodor Schwann
The Cell Theory is a fundamental principle in biology formulated in the late 1830s. Matthias Schleiden, a botanist, and Theodor Schwann, a zoologist, independently concluded that plants and animals are composed of cells. Their combined work established that the cell is the basic structural and functional unit of all living things. Later, Rudolf Virchow added that all cells arise from pre-existing cells.

42. (B) I and III
Mitochondria are vital organelles known as the powerhouses of the cell because they generate ATP through aerobic respiration. They are unique for possessing their own circular DNA and 70S ribosomes, supporting the endosymbiotic theory of their origin. Structurally, they have a double membrane, with the inner membrane folded into cristae to increase surface area, rather than being a single smooth membrane.

43. (A) Dmitri Ivanovsky
Dmitri Ivanovsky is credited with discovering the first virus in 1892 while studying Tobacco Mosaic Disease. He observed that the infectious agent could pass through filters that trapped

Click Here to Buy book on Amazon

of different vertebrates, like fish, birds, and humans, show remarkably similar stages early in development, such as the presence of pharyngeal gill slits and a tail.

78. (A) I, II, III, IV and V
Population genetics studies how allele frequencies change due to various evolutionary forces. Genetic drift involves random changes in small populations. Gene flow occurs through migration between populations. Mutations create new alleles. Non-random mating affects genotype frequencies. Finally, natural selection systematically favors certain alleles based on their adaptive value. Together, these processes drive the genetic divergence and evolutionary change observed in all natural populations over time.

79. (B) Rapid burial to exclude oxygen and decay.
Fossilization is a rare process that requires specific environmental conditions. The most important factor is the rapid burial of an organism after death, typically by sediment in water or volcanic ash. This quick coverage protects the remains from scavengers and excludes oxygen, which prevents rapid bacterial decomposition. Over long periods, minerals replace the organic tissues, eventually turning the remains into stone.

80. (D) Homologous structures indicate divergent evolution from a common ancestor.
Homologous structures are those that share a common anatomical framework due to shared ancestry, such as vertebrate limbs. They indicate divergent evolution, where different species evolve from a common ancestor but adapt to different environments. Conversely, analogous structures, like the wings of birds and insects, indicate convergent evolution, where unrelated species develop similar functional traits independently to survive in similar ecological niches.

81. (A) Non-functional organs functional in ancestors.
Vestigial organs are physical structures that have lost most or all of their original function through the process of evolution. These organs were fully functional and necessary in ancestral species but became redundant as the organism's environment or lifestyle changed. In humans, examples include the vermiform appendix, wisdom teeth, and the tailbone, which provide evidence of our evolutionary past and shared biological history.

82. (A) I and II
Adaptations are traits that enhance an organism's survival. Hibernation is a behavioral adaptation used to conserve energy during harsh winters. Camouflage is a morphological adaptation that allows organisms to blend into their surroundings to avoid predators. Contrary to being accidental, the presence of blubber in whales is a critical physiological and morphological adaptation for insulation and energy storage in cold marine environments.

83. (A) Pisum sativum (Garden pea)
Gregor Mendel, often called the Father of Genetics, performed his foundational experiments using the garden pea, Pisum sativum. He chose this plant because it was easy to grow, had a short life cycle, and possessed several clear, contrasting traits like flower color and seed shape. His systematic cross-breeding and mathematical analysis of the offspring led to the discovery of the basic laws of inheritance.

84. (A) P-II, Q-I, R-III, S-IV
Human evolution is marked by a significant increase in brain size over millions of years. Australopithecus had a small capacity, similar to modern apes. Homo habilis, the "handy man," showed a slight increase. Homo erectus, known for using fire and migrating widely, had a much larger brain. Neanderthals possessed a brain capacity comparable to, and sometimes larger than, that of modern humans.

85. (A) Both A and R are true and R is the correct explanation of A.
Allopatric speciation is the most common form of speciation, occurring when a population is physically divided by a geographic barrier like a mountain range or river. This isolation prevents individuals from interbreeding, effectively stopping gene flow. Over time, different selective pressures and genetic drift cause the two groups to diverge genetically until they become distinct species that can no longer reproduce together.

NODIA

52. (A) P-II, Q-I, R-IV, S-III
Viruses are highly specialized infectious agents that target specific hosts. Bacteriophages infect bacterial cells, while Tobacco Mosaic Virus is a classic rod-shaped virus affecting plants. Retroviruses, such as HIV, are unique for using reverse transcriptase to convert their RNA into DNA. Adenoviruses are common causes of various respiratory infections in humans. Each type demonstrates the diverse structural and functional adaptations found across different viral families.

53. (A) II - IV - I - III
Prophase I of meiosis is a complex stage divided into five distinct substages. It starts with leptotene, where chromosomes become visible. In zygotene, homologous chromosomes pair up (synapsis). Pachytene follows, where crossing over occurs between non-sister chromatids. In diplotene, the synaptonemal complex dissolves, and chiasmata become apparent. Finally, diakinesis involves the complete terminalization of chiasmata and preparation for the subsequent metaphase stage.

54. (C) Aves
Class Aves, which includes all birds, possesses several specialized anatomical adaptations for flight. Their bones are pneumatic, meaning they are hollow and light, reducing overall body weight. The sternum features a large keel for the attachment of powerful flight muscles. Additionally, birds have replaced heavy teeth with a lightweight beak and possess feathers, all of which are essential evolutionary features for efficient aerial locomotion.

55. (D) Adult Amphibia - Gills exclusively
Vertebrates use various organs for respiration depending on their environment and life stage. Fish use gills to extract oxygen from water. Reptiles and birds use lungs, with birds having air sacs for increased efficiency. While larval amphibians (tadpoles) rely on gills, adult amphibians typically use a combination of lungs, moist skin (cutaneous respiration), and the mouth lining, rather than relying exclusively on gills.

56. (A) Both A and R are true and R is the correct explanation of A.
Lysosomes are essential organelles that function as the cell's waste disposal system. They contain acidic hydrolases capable of breaking down all types of biological polymers. When a cell is severely damaged or reaches the end of its life, lysosomes can rupture, releasing these enzymes into the cytoplasm. This results in the digestion of the cell's own components, a process known as autolysis or "suicide."

57. (B) Thylakoids
Inside chloroplasts, the thylakoid system consists of stacks of flattened, membrane-bound sacs called grana. These structures contain chlorophyll and other pigments necessary for capturing light energy. The thylakoid membranes are the specific site where the light-dependent reactions of photosynthesis occur, generating ATP and NADPH. The surrounding fluid-filled space is the stroma, where the subsequent light-independent reactions or Calvin cycle take place.

NODIA

58. (A) I, II, III and V
Meiosis is a specialized cell division essential for sexual reproduction. It involves two sequential rounds of division, resulting in four haploid daughter cells from one diploid parent. This process ensures a constant chromosome number across generations by halving it in gametes. Meiosis also introduces genetic variation through crossing over during Prophase I. It occurs only in germ cells, while mitosis handles somatic cell repair.

59. (A) Membranes with ribosomes for protein synthesis.
The Rough Endoplasmic Reticulum (RER) is a network of interconnected membranous sacs characterized by the presence of ribosomes on its outer surface. These ribosomes give it a "rough" appearance under a microscope and are the sites of protein synthesis. Proteins produced on the RER are typically destined for secretion, incorporation into the cell membrane, or delivery to specific organelles like lysosomes.

60. (C) Mitosis produces genetically identical cells, while meiosis produces varied cells.
Mitosis and meiosis serve different biological purposes. Mitosis is an equational division used

expression of a trait, such as eye color. The genotype is the actual genetic makeup or set of alleles an organism possesses. Understanding these terms is fundamental to predicting the outcomes of genetic crosses.

113. (A) I - II - III - IV
Colour blindness inheritance follows a specific criss-cross pattern. A colour-blind male passes his defective X chromosome to all of his daughters, who become vision-normal carriers. These carrier daughters then have a 50% chance of passing that same defective X chromosome to their sons. Consequently, the trait often appears to skip a generation, moving from a grandfather to his grandson through a carrier female.

114. (C) Test cross
A test cross is a fundamental genetic tool used to identify the genotype of an individual displaying a dominant phenotype. By crossing this individual with one that is homozygous recessive for the same trait, the offspring's phenotypes reveal whether the parent was homozygous or heterozygous. This technique is crucial in breeding and research to determine the genetic purity of individuals for specific traits.

115. (A) Grasshopper - XX (female) / XO (male)
Sex determination mechanisms vary significantly across different animal species. In grasshoppers, sex is determined by an XO system where females have two X chromosomes (XX) and males have only one (XO). This differs from humans (XY system) and birds (ZW system, where females are ZW and males are ZZ). Honeybees use a unique haplodiploid system where sex is determined by the number of chromosome sets.

116. (A) Both A and R are true and R is the correct explanation of A.
Persons with blood group O are considered universal donors because their red blood cells do not have A or B antigens on their surface. When this blood is transfused, the recipient's immune system will not recognize it as foreign and will not produce antibodies against it. This prevents the dangerous clumping of cells known as agglutination, making type O blood safe for almost any recipient.

117. (B) SRY gene
The SRY gene, located on the short arm of the Y chromosome, is the master switch for male sex determination in humans. It provides the instructions for making the sex-determining region Y protein, which triggers the development of undifferentiated gonads into testes. The hormones subsequently produced by the testes then drive the development of other male physical characteristics during embryonic growth and later puberty.

118. (A) I, II, III and IV
The ABO blood group system is governed by a single gene called 'I', which has three alleles: IA, IB, and i. Alleles IA and IB are both dominant over the recessive allele i. When IA and IB are present together, they are codominant, resulting in the AB blood type. This system is an example of both multiple allelism and codominance, but it is not polygenic.

119. (D) A dominant allele on the other X masks the trait.
In females, who possess two X chromosomes, a recessive sex-linked trait will only be expressed if both X chromosomes carry the mutant allele. If a female has one mutant allele and one normal dominant allele, the dominant version will mask the recessive one, resulting in a normal phenotype. Such individuals are called carriers because they can still pass the recessive allele to their children.

120. (A) In dominance, the heterozygote matches one parent; in incomplete, it is a blend.
The key difference between complete dominance and incomplete dominance lies in the phenotypic expression of the heterozygote. In complete dominance, the heterozygote looks exactly like the homozygous dominant parent because the dominant allele fully masks the recessive one. In incomplete dominance, neither allele is completely dominant, resulting in an intermediate phenotype that appears as a blend of the two homozygous parental forms.

121. (B) A DNA sequence coding for a protein or RNA product.
A gene is the basic physical and functional unit of heredity. Chemically, it consists of a specific sequence of nucleotides within a DNA molecule

Downloaded from www.pdf.tube

69. (B) Darwin completely rejected the concept of overproduction of offspring.
While Darwin's theory was revolutionary, it had limitations because genetics was not yet understood. He correctly emphasized overproduction of offspring as a driver of the struggle for existence. However, he could not explain the physical mechanism of inheritance or distinguish between variations occurring in body cells (somatic) versus those in sex cells (germinal). He also primarily focused on small, continuous variations rather than sudden genetic mutations.

70. (A) I, II, III and IV
Modern evolutionary biology identifies several key forces that drive the formation of new species. Genetic mutations and recombinations provide the raw material of genetic variation. Natural selection then acts on this variation, favoring individuals best adapted to their environment. Finally, reproductive isolation prevents gene flow between populations, allowing them to diverge until they can no longer interbreed, thus completing the process of speciation.

71. (D) Forelimbs of a frog and forelimbs of a lizard
Analogous organs are structures that perform similar functions but have different evolutionary origins, such as the wings of insects and birds. In contrast, the forelimbs of a frog and a lizard are homologous organs. Although they may look different, they share a common skeletal pattern inherited from a shared vertebrate ancestor, indicating a deep evolutionary relationship despite their different habitats and movements.

72. (A) P-III, Q-IV, R-I, S-II
Scientific understanding of evolution resulted from contributions by many thinkers. Lamarck proposed the inheritance of acquired traits. Darwin developed the theory of natural selection. Hugo de Vries introduced the mutation theory based on his work with evening primrose. T.R. Malthus influenced Darwin with his essay on population growth, which highlighted how limited resources lead to a struggle for existence among living organisms.

73. (A) II - I - IV - III
Darwin's theory follows a logical sequence. It begins with the overproduction of offspring, which exceeds available resources. This leads to a struggle for existence among individuals. Since individuals within a population show variations, those with advantageous traits are more likely to survive and reproduce. This "survival of the fittest" results in the gradual modification of the population over successive generations of life.

74. (B) Reproductive success in a given environment.
In evolutionary terms, "fitness" does not necessarily mean physical strength or speed. Instead, it refers to an individual's ability to survive and, most importantly, reproduce in its specific environment. An organism that is "fit" leaves more viable offspring than others, ensuring its genes are passed on. Over time, traits that contribute to higher reproductive success become more common within the population.

75. (A) Morphological evidence - Isotopic dating of rocks
Isotopic dating is a technique used in geology and paleontology to determine the absolute age of rocks and fossils, not a form of morphological evidence. Morphological evidence focuses on comparing the physical structures of different organisms. Other valid pairings include paleontological evidence from fossils like Archaeopteryx, embryological evidence from shared developmental stages, and molecular evidence derived from comparing DNA or protein sequences.

NODIA

76. (A) Both A and R are true and R is the correct explanation of A.
Archaeopteryx is a famous fossil that serves as a transitional link between reptiles and birds. It displays a unique combination of features from both groups, such as reptilian teeth and a long bony tail, along with avian feathers and wings. This fossil provides strong physical evidence for the evolutionary theory that modern birds descended from small, feathered theropod dinosaurs.

77. (D) Embryology
Ernst Haeckel's principle, "Ontogeny recapitulates Phylogeny," suggests that the embryonic development of an individual (ontogeny) repeats the evolutionary history of its species (phylogeny). This idea was based on observations in embryology, where embryos

inherit one allele from each parent, restoring the diploid number.

95. (B) Anatomical adaptation - Bird vocalizations (singing)
Adaptations are categorized by how they help an organism survive. Bird vocalizations are behavioral adaptations, as they involve actions taken by the organism for communication or mating. Anatomical adaptations refer to physical structures, like a bird's beak or a duck's webbed feet. Physiological adaptations involve internal processes, such as a kangaroo rat's ability to produce highly concentrated urine to conserve water in the desert.

96. (A) Both A and R are true and R is the correct explanation of A.
Mendel's Law of Independent Assortment describes how different genes independently separate from one another when reproductive cells develop. In a dihybrid cross, which tracks two traits simultaneously, the segregation of alleles for one gene does not influence the segregation of alleles for the other. This results in offspring with new combinations of traits that were not present in either of the parents.

97. (A) Definitive construction and use of stone tools.
Homo habilis is distinguished from its predecessors, like Australopithecus, by its increased cognitive ability and manual dexterity. This is evidenced by the definitive construction and use of primitive stone tools, which earned the species the nickname "handy man." While they had larger brains than Australopithecus, they had not yet reached modern human brain size or mastered fire, which occurred in later species.

98. (A) I, II, III and IV
The evolution of modern humans involved several significant anatomical changes. These include a massive increase in cranial capacity to accommodate a larger brain, a flattening of the face, the development of a distinct chin, and the loss of heavy brow ridges. Crucially, human ancestors transitioned from quadrupedal (four-legged) to bipedal (two-legged) locomotion, which is one of the most defining characteristics of our lineage.

99. (A) Reproductive isolation from other such groups.
The biological species concept, most famously advocated by Ernst Mayr, defines a species as a group of populations whose members can interbreed and produce fertile offspring. The key factor is reproductive isolation, which prevents gene flow between different species. While morphology and habitat are useful for identification, the ability to maintain a distinct gene pool through reproduction is the primary biological criterion.

100. (D) Aquatic
Organisms living in water develop specific adaptations for movement and gas exchange. A streamlined body shape reduces drag while swimming. Gills or blowholes are essential for obtaining oxygen in or from the water. Fins and flippers provide the necessary propulsion and steering. These features are found across diverse aquatic groups, from fish to marine mammals like dolphins, demonstrating convergent evolution for life in water.

101. (B) Dihybrid cross
A dihybrid cross is a genetic experiment where the inheritance of two different traits is studied simultaneously. For example, Mendel crossed pea plants that differed in both seed shape and seed color. This type of cross allows researchers to observe how different pairs of alleles segregate and whether they are inherited independently of one another, following the principles of Mendelian genetics.

102. (A) I and II
Incomplete dominance is a genetic phenomenon where the dominant allele does not completely mask the recessive one. This results in an F1 hybrid with an intermediate phenotype that is a blend of both parents. A classic example is the four o'clock plant, where crossing red and white flowers yields pink offspring. This differs from codominance, where both alleles are fully and separately expressed.

103. (D) Karl Landsteiner
Karl Landsteiner was an Austrian biologist and physician who discovered the major human blood groups in 1900. By observing how different blood samples agglutinated when mixed, he identified

Click Here to Buy book on Amazon

86. (C) Sympatric speciation lacks geographical isolation.
Speciation can occur with or without geographic barriers. Sympatric speciation happens within the same geographic area, often driven by factors like polyploidy, sexual selection, or habitat differentiation. This differs from allopatric speciation, which requires physical isolation. Speciation is usually a gradual process involving many individuals, and new species are defined by their inability to produce fertile offspring with the original parent population.

87. (D) Nictitating membrane - Human eye
Vestigial organs provide evidence of evolutionary history. The nictitating membrane is a "third eyelid" functional in many animals but reduced to a small fold in the corner of the human eye. Other examples include the vermiform appendix in the large intestine and wisdom teeth at the back of the jaw. These structures remain in the body but no longer perform their original biological functions.

88. (A) I - II - III - IV - V
The evolutionary path of modern humans follows a clear chronological sequence. It began with Australopithecus in Africa, followed by Homo habilis, the first tool user. Next was Homo erectus, who first used fire. Neanderthals appeared later, living in Europe and Asia. Finally, Homo sapiens emerged as the modern human species. Each stage represents advancements in brain size, tool complexity, and cultural behaviors.

89. (B) Independent assortment holds for linked genes.
Mendel's Law of Independent Assortment states that the inheritance of one trait does not affect the inheritance of another. However, this rule only applies to genes located on different chromosomes or very far apart on the same chromosome. Genes located close together on the same chromosome are "linked" and tend to be inherited together, which is a major exception to Mendel's original findings.

90. (A) I, II and III
Xerophytes are plants adapted to survive in extremely dry environments. Their adaptations focus on water conservation, including modifying leaves into spines to reduce surface area, developing a thick waxy cuticle to prevent evaporation, and having sunken stomata to minimize transpiration. Broad, thin leaves are characteristic of plants in moist or shaded areas where maximizing light absorption is more critical than preventing water loss.

91. (A) Epiglottis
The epiglottis is a vital, functional organ in humans that prevents food and liquid from entering the trachea during swallowing. In contrast, auricular muscles, the coccyx (tailbone), and body hair are considered vestigial. These structures were more prominent or functional in our ancestors but have lost their original purpose as humans evolved different modes of locomotion, communication, and environmental protection.

92. (A) P-IV, Q-II, R-I, S-III
Each hominid ancestor is associated with specific biological or cultural milestones. Australopithecus was a bipedal ape-man. Homo habilis is known as the "handy man" for creating stone tools. Homo erectus was the first to master the use of fire. Neanderthals were culturally advanced, known for burying their dead with rituals. These distinctions help anthropologists trace the complex development of human biology and society.

93. (A) II - I - III - IV
Allopatric speciation begins when a physical barrier divides a population into two. These isolated groups then accumulate genetic differences over time due to mutations and natural selection in their different environments. Eventually, these differences lead to reproductive isolation, meaning they can no longer interbreed even if they meet again. This final step marks the formation of two distinct and separate biological species.

94. (C) Gene pairs separate during gametogenesis.
Mendel's Law of Segregation is based on the biological process of meiosis. Each individual possesses two alleles for a particular trait. During the formation of gametes (sperm and egg cells), these two alleles separate, or segregate, so that each gamete receives only one allele. This ensures that when fertilization occurs, the offspring will

NODIA

for growth and repair, producing two daughter cells that are genetically identical to the parent. Meiosis is a reductional division used for gamete formation, involving two rounds of division and crossing over. This process results in four daughter cells with half the original chromosome number and unique genetic combinations, fostering diversity.

61. (D) Descent with modification over successive generations.
Biological evolution refers to the gradual change in the heritable characteristics of populations over many generations. It is not an individual adaptation or a purposeful strive for perfection, but rather a process of "descent with modification." This means that offspring inherit traits from their parents, but small changes can accumulate over time, eventually leading to the emergence of new species from common ancestors.

62. (A) I and II
Lamarckism was an early theory of evolution based on two main ideas. First, he proposed that an internal vital force drives organisms to become larger and more complex. Second, he believed in the inheritance of acquired characters, where traits developed through use or disuse during an individual's lifetime are passed to offspring. Natural selection is a Darwinian concept, not part of Lamarck's original theory.

63. (B) Charles Darwin
Charles Darwin published his groundbreaking book "On the Origin of Species" in 1859, introducing the theory of evolution by natural selection. Based on his extensive observations, particularly during his voyage on the HMS Beagle, Darwin argued that individuals with favorable traits are more likely to survive and reproduce. Over time, this process leads to gradual changes in populations and the diversification of life.

64. (A) P-IV, Q-II, R-III, S-I
Evidence for evolution comes from many scientific disciplines. Paleontology provides a record of past life through fossils. Comparative anatomy examines homologous organs that share a common origin but have different functions. Embryology observes developmental patterns, like gill slits in embryos, suggesting shared ancestry. Molecular biology analyzes DNA and protein sequences, showing that closely related species have more similar genetic information than distantly related ones.

65. (A) Both A and R are true and R is the correct explanation of A.
Natural selection is the primary mechanism of evolution proposed by Charles Darwin. It occurs because individuals within a population exhibit variations in their traits. Those with variations better suited to their specific environment have a higher chance of survival and reproductive success. These advantageous traits are passed to the next generation, gradually increasing their frequency in the population and leading to evolutionary change.

66. (C) It combines genetics, selection, and mutation.
The Modern Synthetic Theory, or Neo-Darwinism, is the contemporary explanation of evolution. it integrates Charles Darwin's theory of natural selection with modern genetics, particularly the roles of DNA mutation, genetic recombination during meiosis, and reproductive isolation. Unlike older theories, it recognizes that evolution is a population-level process driven by changes in allele frequencies over time, providing a comprehensive framework for biological diversity.

67. (A) Homologous organs - Forelimbs of whale, bat, and human
Homologous organs are structures that share a common anatomical origin and evolutionary ancestry, even if they perform different functions in modern species. For example, the forelimbs of whales (flippers), bats (wings), and humans (arms) all have a similar bone structure despite being used for swimming, flying, and grasping. Analogous organs, like bird and insect wings, have different origins but similar functions.

68. (A) I - II - III
The geological time scale organizes Earth's history into major eras based on significant biological and geological events. The Paleozoic Era (oldest) saw the rise of fish, amphibians, and early land plants. The Mesozoic Era, known as the Age of Reptiles, followed. Finally, the Cenozoic Era is the most recent, characterized by the dominance of mammals, flowering plants, and the eventual emergence of humans.

Downloaded from www.pdf.tube

the A, B, and O types. His groundbreaking work made safe blood transfusions possible and earned him the Nobel Prize. The ABO system is now known to be a prime example of multiple allelism and codominance.

104. (A) P-II, Q-I, R-III, S-IV
The ABO blood system is determined by three alleles: IA, IB, and i. Genotype IAIB results in blood group AB due to codominance. The genotype ii results in blood group O because it is recessive. Genotypes like IAi or IAIA produce blood group A, while IBi or IBIB produce blood group B. These combinations demonstrate how multiple alleles interact to create diverse phenotypes.

105. (A) Both A and R are true and R is the correct explanation of A.
In humans, sex determination is chromosomal. Males are heterogametic, meaning they produce two types of sperm: 50% carry an X chromosome and 50% carry a Y chromosome. Females are homogametic, producing only X-bearing eggs. Therefore, the sex of the child depends entirely on whether the egg is fertilized by an X-bearing or a Y-bearing sperm from the male parent.

106. (B) It is common in males with one X chromosome.
Colour blindness is an X-linked recessive disorder. Since males have only one X chromosome, a single recessive allele from their mother will cause the condition. Females, having two X chromosomes, must inherit the recessive allele from both parents to be affected. Consequently, colour blindness is much more prevalent in males, while females are more likely to be asymptomatic carriers of the trait.

107. (A) Test cross (Monohybrid) - 1:1
A monohybrid test cross involves crossing an individual with an unknown genotype with a homozygous recessive individual. If the unknown is heterozygous, the resulting phenotypic and genotypic ratio in the offspring will be 1:1. While other standard Mendelian ratios include 3:1 for a monohybrid cross and 9:3:3:1 for a dihybrid cross, the 1:1 ratio is the classic expectation for this specific diagnostic cross.

NODIA

108. (A) I - II - III - IV
Mendel used a precise technique for artificial hybridization in pea plants. First, he performed emasculation by removing the stamens of the female parent to prevent self-pollination. Next, he covered the flowers (bagging) to exclude unwanted pollen. He then performed cross-pollination using pollen from a chosen male parent. Finally, he collected the resulting seeds and planted them to observe the traits of the next generation.

109. (D) A blending of traits creates intermediate phenotypes.
Codominance occurs when two different alleles for a gene are both fully expressed in the phenotype of a heterozygote. In the AB blood group, both A and B antigens are present on the red blood cells simultaneously. Unlike incomplete dominance, there is no blending or creation of an intermediate form; instead, both parental traits appear together, each maintaining its distinct and original biological identity.

110. (A) I, II and IV
Haemophilia is a well-known X-linked recessive genetic disorder that impairs the body's ability to form blood clots. It is often called "bleeder's disease" because even minor injuries can lead to prolonged bleeding. Like other X-linked traits, it primarily affects males. Queen Victoria is a famous historical carrier who passed the allele to several of her descendants, affecting many European royal families.

111. (B) Human skin colour controlled by three different genes
Multiple allelism involves more than two alleles for a single gene existing within a population, such as the ABO blood group or Drosophila eye color. In contrast, human skin color is an example of polygenic inheritance, where multiple separate genes work together to determine a single trait. This results in a continuous spectrum of phenotypes rather than a few distinct categories.

112. (A) P-III, Q-IV, R-I, S-II
Genetic terminology is essential for describing inheritance patterns. Homozygous refers to having two identical alleles for a trait, while heterozygous means having two different alleles. The phenotype is the observable physical

bacteria, suggesting it was smaller than any known microbe. His work laid the foundation for the field of virology. Later, Martinus Beijerinck termed the agent a "contagium vivum fluidum," or a contagious living fluid.

44. (A) P-II, Q-I, R-IV, S-III
Vertebrate hearts show evolutionary progression in complexity. Fish have a simple two-chambered heart. Amphibians possess a three-chambered heart with two atria and one ventricle. Most reptiles have a three-chambered heart with a partially divided ventricle, representing an intermediate stage. Birds and mammals have the most advanced four-chambered heart, which completely separates oxygenated and deoxygenated blood, supporting high metabolic rates.

45. (A) Both A and R are true and R is the correct explanation of A.
Viruses are classified as obligate intracellular parasites because they cannot carry out metabolic processes or reproduce on their own. They lack the necessary cellular machinery, such as ribosomes and enzymes for energy production. To replicate, a virus must infect a compatible living host cell and hijack its molecular tools to synthesize viral proteins and nucleic acids, eventually producing new viral particles.

46. (C) Prokaryotic cells have a nucleoid, whereas eukaryotes have a nucleus.
The primary distinction between prokaryotic and eukaryotic cells lies in their internal organization. Prokaryotes, like bacteria, lack a membrane-bound nucleus and instead store their genetic material in an irregularly shaped region called a nucleoid. In contrast, eukaryotes possess a true, membrane-enclosed nucleus that houses their DNA. Eukaryotes also contain various membrane-bound organelles, such as mitochondria and lysosomes, which are absent in prokaryotes.

47. (B) Lysosome - Intracellular digestion
Lysosomes are specialized membrane-bound vesicles containing powerful hydrolytic enzymes. Their primary function is intracellular digestion, where they break down macromolecules, worn-out organelles, and foreign substances like bacteria. Other organelles have distinct roles: ribosomes are the sites of protein synthesis, the smooth endoplasmic reticulum is involved in lipid synthesis and detoxification, and the Golgi apparatus modifies and packages proteins for secretion.

48. (A) I - II - III - IV
The eukaryotic cell cycle is a highly regulated sequence of events leading to cell division. It begins with the G1 phase (Gap 1), where the cell grows. This is followed by the S phase (Synthesis), where DNA is replicated. Then comes the G2 phase (Gap 2), preparing the cell for division. Finally, the M phase (Mitosis) occurs, where the cell divides.

49. (A) It involves the pairing of homologous chromosomes and crossing over.
Mitosis is a form of equational division that produces two genetically identical daughter cells, maintaining the same chromosome number as the parent cell. It is crucial for growth, tissue repair, and asexual reproduction. Pairing of homologous chromosomes and crossing over are exclusive features of meiosis, not mitosis. In mitosis, sister chromatids separate during anaphase to ensure that each new cell receives an exact copy.

50. (A) I, II, III and IV
Mammals are a diverse group of vertebrates defined by several key characteristics. They possess mammary glands to nourish their young with milk and have a four-chambered heart for efficient circulation. Mammals are homoiothermous, meaning they maintain a constant body temperature. Additionally, the presence of hair or fur and external ear structures called pinnae are common morphological traits that distinguish them from other vertebrates.

51. (A) Typhoid
Typhoid is a serious systemic infection caused by the bacterium Salmonella typhi, typically spread through contaminated food and water. In contrast, poliomyelitis, rabies, and dengue fever are all caused by different types of viruses. Distinguishing between bacterial and viral pathogens is critical in medicine because treatments, such as the use of antibiotics for bacteria, are specific to the type of infectious agent.

Click Here to Buy book on Amazon

that contains the instructions needed to build a particular protein or functional RNA molecule. Genes are organized on chromosomes, and they determine everything from an organism's physical traits to its internal biochemical processes and overall biological development.

122. (A) I and II
The DNA double helix structure, proposed by Watson and Crick, consists of two long chains of nucleotides. These chains run in opposite directions, a property known as being antiparallel. The structure is held together by hydrogen bonds between specific nitrogenous bases: Adenine always pairs with Thymine via two hydrogen bonds, and Guanine pairs with Cytosine via three hydrogen bonds to ensure structural stability.

123. (A) Rosalind Franklin and Maurice Wilkins
Rosalind Franklin and Maurice Wilkins used X-ray crystallography to study the structure of DNA. Franklin's famous "Photo 51" provided the critical visual evidence of DNA's helical shape and the spacing of its repeating units. Although Watson and Crick used this data to build their double helix model, Franklin's experimental work was essential for understanding the physical dimensions and molecular arrangement of the genetic material.

124. (A) P-III, Q-I, R-II, S-IV
Different types of RNA perform specialized roles in the cell. Messenger RNA (mRNA) carries genetic information from the DNA in the nucleus to the ribosomes. Transfer RNA (tRNA) acts as an adapter, bringing the correct amino acids to the ribosome during protein synthesis. Ribosomal RNA (rRNA) forms the structural core of the ribosome. Small nuclear RNA (snRNA) is involved in processing pre-mRNA through splicing.

125. (A) Both A and R are true and R is the correct explanation of A.
DNA replication is described as semi-conservative because of how the genetic information is copied. During the process, the original double-stranded DNA molecule unwinds, and each strand serves as a template for the synthesis of a new complementary strand. As a result, each of the two resulting DNA molecules consists of one "old" parental strand and one "new" daughter strand, ensuring genetic continuity.

126. (C) Only one DNA strand acts as an RNA template.
Transcription is the first step of gene expression, where a segment of DNA is copied into RNA by the enzyme RNA polymerase. During this process, only one of the two DNA strands, called the template strand, is used to guide the synthesis of the RNA molecule. This ensures that the genetic message is transcribed accurately and only in the intended direction for protein synthesis.

127. (B) Primase - Adds methyl groups to DNA bases
DNA replication requires several specialized enzymes. Helicase unwinds the double helix, while DNA polymerase synthesizes the new strands. Ligase joins together short segments called Okazaki fragments on the lagging strand. Primase is the enzyme responsible for synthesizing short RNA primers, which provide the necessary starting point for DNA polymerase to begin adding nucleotides. It does not add methyl groups to the DNA.

128. (B) DNA → RNA → Protein
The Central Dogma of molecular biology describes the directional flow of genetic information within a biological system. It states that DNA contains the master instructions, which are first transcribed into messenger RNA (mRNA). This mRNA is then translated by ribosomes into a specific sequence of amino acids to form a protein. This fundamental process ensures that the genetic code is correctly expressed as functional molecules.

129. (A) Translation synthesizes DNA from an RNA template.
Translation is the process of synthesizing a protein from an mRNA template, not DNA from RNA. It occurs in the cytoplasm on ribosomes, where tRNA molecules read the genetic code in sets of three nucleotides called codons. Each codon corresponds to a specific amino acid. The process begins at a start codon and continues until a stop codon is reached, resulting in a functional polypeptide chain.

Downloaded from www.pdf.tube

(C) Tricuspid valve
(D) Mitral valve
(E) Answer not known

31. Match List I with List II regarding blood composition.
List I: (Component)
P. Plasma
Q. Erythrocytes
R. Leukocytes
S. Thrombocytes
List II: (Function)
I. Blood clotting
II. Transport of oxygen
III. Fluid matrix of blood
IV. Defense mechanism
(A) P-III, Q-II, R-IV, S-I
(B) P-III, Q-IV, R-II, S-I
(C) P-II, Q-III, R-I, S-IV
(D) P-I, Q-II, R-IV, S-III
(E) Answer not known

32. Read the given assertion and reason and select the correct option.
Assertion (A): Erythroblastosis fetalis occurs when an Rh-negative mother carries an Rh-positive fetus.
Reason (R): The mother produces anti-Rh antibodies that cross the placenta and destroy fetal red blood cells.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

33. Which of the following pairs regarding the human excretory system is incorrectly matched?
(A) Kidneys - Filtration of blood
(B) Urinary Bladder - Synthesis of urea
(C) Ureters - Transport urine from kidney to bladder
(D) Urethra - Elimination of urine
(E) Answer not known

34. Consider the following statements regarding the lymphatic system:
I. Lymph contains more proteins than blood plasma.
II. Lymph nodes filter foreign particles and bacteria from the length.
III. The lymphatic system absorbs dietary fats from the small intestine.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

35. Consider the following statements regarding urine formation in the nephron:
I. Glomerular filtration is a non-selective process based on size and pressure.
II. Tubular reabsorption mostly occurs in the Bowman's capsule.
III. Tubular secretion helps maintain the ionic and acid-base balance of body fluids.
IV. Antidiuretic hormone (ADH) increases water reabsorption in the collecting duct.
Which of the above statement(s) is/are correct?
(A) I, III and IV
(B) I, II and III
(C) II and IV
(D) I, II and IV
(E) Answer not known

36. Select the correct sequence of the parts of a nephron through which the filtrate passes.
(A) Bowman's capsule, Proximal Convoluted Tubule, Loop of Henle, Distal Convoluted Tubule, Collecting Duct
(B) Bowman's capsule, Distal Convoluted Tubule, Loop of Henle, Proximal Convoluted Tubule, Collecting Duct
(C) Glomerulus, Loop of Henle, Proximal Convoluted Tubule, Distal Convoluted Tubule, Collecting Duct
(D) Proximal Convoluted Tubule, Bowman's capsule, Loop of Henle, Distal Convoluted Tubule, Collecting Duct
(E) Answer not known

37. Which function is most relevant to the role of the spleen in the human body?
(A) Filtration of blood and storage of red blood cells within the splenic reservoir
(B) Production and secretion of digestive enzymes into the duodenum for food breakdown

NODIA

139. (A) An adapter matching specific amino acids to mRNA.
Transfer RNA (tRNA) is a specialized RNA molecule that serves as a bridge between the genetic code and the amino acids that make up a protein. Each tRNA has an anticodon that recognizes a specific codon on the mRNA and carries the corresponding amino acid to the ribosome. This adapter function is essential for ensuring that the protein is built with the correct sequence of amino acids.

140. (C) A nitrogenous base, a pentose sugar, and a phosphate group.
Nucleotides are the fundamental building blocks of nucleic acids like DNA and RNA. Each nucleotide is composed of three essential parts: a nitrogenous base (adenine, guanine, cytosine, thymine, or uracil), a five-carbon pentose sugar (ribose or deoxyribose), and a phosphate group. These units link together to form the long chains that store and transmit the genetic information necessary for all living organisms.

141. (D) Inheritable alteration in the DNA sequence.
A mutation is a change that occurs in the DNA sequence of an organism's genome. These changes can range from a single base pair modification to large-scale chromosomal rearrangements. Mutations are significant because they are the primary source of genetic variation, which is the raw material for evolution. If a mutation occurs in germ cells, it can be passed down to subsequent generations, potentially affecting their traits.

142. (A) I and II
Down syndrome is a common chromosomal disorder caused by the presence of an extra copy of chromosome 21, a condition known as trisomy. Affected individuals often exhibit characteristic physical features, including a broad flat face, slanted eyes, and a single deep crease across the palm. Unlike color blindness or hemophilia, Down syndrome is an autosomal disorder, meaning it affects chromosomes that are not involved in sex determination.

143. (B) Ian Wilmut
In 1996, Ian Wilmut and his colleagues at the Roslin Institute successfully cloned the first mammal, a sheep named Dolly, using a technique called somatic cell nuclear transfer. This was a revolutionary achievement because it proved that a specialized adult cell could be reprogrammed to act like an embryonic cell and develop into a complete, genetically identical organism, opening new possibilities in biotechnology.

144. (A) P-II, Q-IV, R-I, S-III
Genetic disorders can often be identified by looking at an individual's karyotype. Down syndrome involves trisomy of chromosome 21. Turner syndrome is characterized by the absence of one X chromosome in females (45, XO). Klinefelter syndrome occurs when a male has an extra X chromosome (47, XXY). A normal human male possesses 44 autosomes and one X and one Y chromosome (46, XY).

145. (A) Both A and R are true and R is the correct explanation of A.
Transgenic animals are created by inserting a foreign gene from another species into their genome. Using advanced genetic engineering techniques, scientists can introduce specific traits, such as increased growth rates or the production of therapeutic proteins. These animals are invaluable in medical research for studying human diseases, testing new drugs, and serving as biological factories for the large-scale production of complex pharmaceutical products.

146. (C) Plasmids are circular DNA used as vectors.
Genetic engineering relies on several key molecular tools. Plasmids are small, circular, extrachromosomal DNA molecules found in bacteria that are commonly used as vectors to carry foreign DNA into a host cell. Restriction endonucleases are the "molecular scissors" that cut DNA at specific sites, while DNA ligase acts as the "glue" to join segments together. PCR is used to amplify DNA, not translate RNA.

147. (A) EcoRI - Escherichia coli
Restriction enzymes are named after the bacterial species from which they are isolated. For example, EcoRI comes from Escherichia coli (strain RY13). These enzymes protect bacteria from viral infections by cutting foreign DNA at specific recognition sequences. Identifying these enzymes and their sources is a fundamental aspect of recombinant DNA technology, as they allow scientists to manipulate and join DNA

Click Here to Buy book on Amazon

130. (A) I, II and IV
DNA and RNA have several key structural and functional differences. DNA uses deoxyribose sugar and is typically double-stranded and very stable, making it ideal for long-term genetic storage. RNA uses ribose sugar, is usually single-stranded, and is more chemically reactive and unstable. Crucially, DNA contains the base Thymine, while RNA replaces it with Uracil. Both play essential, distinct roles in gene expression.

131. (A) RNA Polymerase
Translation involves ribosomes, mRNA, and tRNA working together to build a protein. mRNA provides the code, tRNA brings the amino acids, and the ribosome facilitates the assembly. RNA polymerase, however, is the primary enzyme used in transcription, the process of creating RNA from a DNA template. Therefore, while essential for gene expression, RNA polymerase is not directly involved in the final translation step at the ribosome.

132. (A) P-II, Q-III, R-IV, S-I
The genetic code is a set of rules used by living cells to translate information encoded within genetic material into proteins. It is degenerate, meaning multiple codons can code for the same amino acid. It is nearly universal across all life forms. The code is non-overlapping, with each base being part of only one codon, and unambiguous, because each specific codon always codes for exactly one amino acid.

133. (A) II - IV - I - III
Translation occurs in a highly organized sequence. It begins when an mRNA molecule binds to the small subunit of a ribosome. The initiator tRNA then attaches to the start codon. During the elongation phase, amino acids are added one by one to form a polypeptide chain. Finally, the process reaches a stop codon, which triggers termination and the release of the newly synthesized protein from the ribosome.

134. (C) A:T and G:C ratios are constant and equal one.
Erwin Chargaff's rules were fundamental to the discovery of the DNA double helix. He found that in any DNA sample, the amount of Adenine is always equal to Thymine, and the amount of Guanine is always equal to Cytosine. This means the ratio of purines to pyrimidines is always 1:1. These base-pairing rules ensured that the two strands of the DNA molecule are perfectly complementary.

135. (D) Promoter - Binding site for RNA polymerase
Gene expression is controlled by specific DNA sequences and codons. A promoter is a region of DNA where RNA polymerase binds to initiate transcription. In contrast, AUG is the universal start codon, while UAA, UAG, and UGA serve as stop codons that signal the end of translation. The anticodon loop is a characteristic feature found on tRNA molecules, not on the messenger RNA (mRNA) itself.

136. (A) Both A and R are true and R is the correct explanation of A.
In eukaryotic cells, the primary transcript produced during transcription is called pre-mRNA or hnRNA. This molecule contains both exons, which code for proteins, and introns, which do not. Before the mRNA can be translated, it must undergo splicing, a process where introns are removed and exons are joined together. This ensures that the ribosome receives a continuous, accurate set of instructions for protein synthesis.

137. (B) Histones
Eukaryotic DNA is incredibly long and must be tightly packaged to fit inside the nucleus. This is achieved by wrapping the DNA around specific basic proteins called histones. These protein complexes form bead-like structures called nucleosomes. This organized coiling not only compacts the DNA but also plays a crucial role in regulating gene expression by determining which parts of the genome are accessible for transcription.

NODIA

138. (A) I, II, III and IV
DNA replication is a complex process managed by many enzymes. Topoisomerase prevents the DNA from becoming too tightly coiled, while helicase separates the two strands. Primase provides a starting point, and DNA polymerase III builds the new DNA strands. DNA ligase is responsible for sealing gaps between DNA fragments on the lagging strand, rather than cutting the DNA to prevent twisting as topoisomerase does.

biological risks. Experiments in animals have shown that cloning often leads to high rates of miscarriage, premature aging, and various developmental abnormalities. Beyond health concerns, it raises complex moral questions regarding individuality, human dignity, and the potential for social exploitation, leading most countries to implement strict legal bans on the procedure.

157. (D) Point mutation
A point mutation is a type of genetic change that involves the substitution, insertion, or deletion of a single nucleotide base within a DNA sequence. Depending on where it occurs and what change is made, it can have various effects. Some point mutations are silent, while others can change a single amino acid in a protein or create a premature stop codon, leading to significant biological consequences or genetic disorders.

158. (A) I, II, III and IV
Genetic engineering has a wide range of practical applications. It is used to produce recombinant vaccines, develop microbes for cleaning up environmental pollutants, and provide gene therapy for genetic diseases. In agriculture, it allows for the creation of crops that can withstand environmental stresses like drought or salinity. These molecular techniques are distinct from classical hybridization, which relies on traditional cross-breeding rather than direct laboratory DNA manipulation.

159. (B) It limits modification to individuals only.
Somatic gene therapy is preferred in clinical practice because it targets non-reproductive cells, ensuring that any genetic modifications are restricted to the treated individual. This avoids the ethical dilemma of making permanent changes to the human germline that would be inherited by all future generations. Germline therapy is far more complex and controversial, as any unintended side effects could have permanent, unpredictable consequences for the species' gene pool.

160. (D) Circular, extrachromosomal DNA molecules.
Plasmids are small, circular DNA molecules found in bacteria and some eukaryotes that exist independently of the chromosomal DNA. They are capable of autonomous replication and often carry genes that provide advantages, such as antibiotic resistance. In biotechnology, plasmids are widely utilized as vectors to transport and replicate specific foreign DNA sequences within host cells, making them essential tools for gene cloning and recombinant DNA research.

www.nodia.in

Downloaded from www.pdf.tube

fragments from different organisms with high precision.

148. (A) I - II - III - IV
Creating recombinant DNA involves a systematic four-step process. First, the desired DNA is isolated from the source organism. Second, both the target DNA and the vector are cut using the same restriction enzyme. Third, the DNA fragment is joined, or ligated, into the vector using DNA ligase. Finally, this recombinant molecule is transferred into a host cell, such as a bacterium, for replication and expression.

149. (B) Somatic therapy is passed on to offspring.
Gene therapy is an experimental technique that uses genes to treat or prevent disease. It typically involves replacing a mutated gene with a healthy copy. Somatic gene therapy targets body cells, and these changes are limited to the individual patient and not inherited by their children. In contrast, germline therapy involves sex cells and could be passed down, but it is currently prohibited in humans due to ethical concerns.

150. (A) I, II and III
Turner syndrome and Klinefelter syndrome are both results of chromosomal non-disjunction. Turner syndrome (45, XO) affects females, resulting in underdeveloped sexual characteristics and sterility. Klinefelter syndrome (47, XXY) affects males, often leading to taller stature and sterility due to underdeveloped testes. While both conditions involve changes in the number of sex chromosomes, neither results in a normal, fertile individual of either sex.

151. (D) Traditional selective natural cross-breeding.
Modern biotechnology involves the direct manipulation of genetic material using advanced laboratory techniques. Applications include producing genetically modified crops, creating recombinant insulin, and developing transgenic animals for research. While traditional selective breeding also aims to improve traits in plants and animals, it relies on natural mating processes over many generations and does not involve the precise molecular gene-editing or laboratory DNA transfer characteristic of modern biotechnology.

152. (A) P-III, Q-IV, R-II, S-I
Biotechnology has produced numerous products with diverse applications. Golden Rice is engineered to contain beta-carotene for Vitamin A enrichment. Bt Cotton is a pest-resistant crop that produces its own insecticide. Humulin is the first genetically engineered human insulin for treating diabetes. The Flavr Savr tomato was designed with a longer shelf life by delaying the ripening process through the inhibition of certain fruit-softening enzymes.

153. (A) II - IV - III - I
Somatic cell nuclear transfer, the method used to clone Dolly, begins with isolating a nucleus from a donor's somatic cell. Simultaneously, the nucleus is removed from an unfertilized egg cell. The somatic nucleus is then fused with the enucleated egg using an electric shock. Once the egg begins to develop into an embryo, it is implanted into a surrogate mother to complete the gestation process until birth.

154. (B) Mutagens
Mutagens are chemical or physical agents that increase the frequency of mutations in an organism's DNA. Physical mutagens include ionizing radiation like X-rays and ultraviolet light. Chemical mutagens encompass various substances, such as those found in tobacco smoke or certain industrial chemicals. By damaging the DNA structure or interfering with replication, mutagens can cause genetic changes that may lead to diseases like cancer or contribute to evolutionary variation.

155. (A) Bt Brinjal - Herbicide tolerance
Genetically modified crops are engineered for specific agricultural benefits. Bt crops, like Bt cotton and Bt brinjal, are modified with genes from the bacterium Bacillus thuringiensis to be resistant to certain insect pests. Other modifications include the Flavr Savr tomato for increased shelf life and Golden Rice for Vitamin A enrichment. Herbicide tolerance is a different trait often found in crops like "Roundup Ready" soy or corn.

NODIA

156. (A) Both A and R are true and R is the correct explanation of A.
Reproductive cloning of humans faces nearly universal opposition due to severe ethical and

(D) Mouth, Oesophagus, Small Intestine, Stomach, Large Intestine, Rectum
(E) Answer not known

7. What is the precise biological definition of assimilation in the context of human nutrition?
(A) Physical and chemical breakdown of complex food particles into simpler and absorbable forms
(B) Conversion of absorbed food into cellular structural and functional components
(C) Systematic passage of digested food molecules through the intestinal wall into the blood or lymph
(D) Physiological process involving the elimination of undigested and unabsorbed waste materials
(E) Answer not known

8. The enzyme pepsin, responsible for protein digestion, is active only in which of the following environments?
(A) Highly alkaline environment
(B) Neutral environment
(C) Highly acidic environment
(D) Mildly alkaline environment
(E) Answer not known

9. Identify the correct statement regarding the exocrine function of the pancreas.
(A) Internal secretion of glucagon by alpha cells directly into the systemic bloodstream
(B) Endocrine secretion of insulin by beta cells into the blood to lower glucose levels
(C) Hormonal regulation of the basal metabolic rate through the secretion of thyroxine
(D) Production of pancreatic juice containing digestive enzymes like trypsin and lipase
(E) Answer not known

10. Which among the following is the largest internal organ in the human body, acting as a metabolic powerhouse?
(A) Liver
(B) Stomach
(C) Heart
(D) Brain
(E) Answer not known

11. Match List I with List II regarding respiratory volumes and capacities.

List I: (Volume/Capacity)
P. Tidal Volume
Q. Vital Capacity
R. Residual Volume
S. Total Lung Capacity
List II: (Description)
I. Volume of air remaining in lungs after forceful expiration
II. Volume of air inspired or expired during a normal respiration
III. Total volume of air accommodated in the lungs at the end of forced inspiration
IV. Maximum volume of air a person can breathe in after forced expiration
(A) P-II, Q-IV, R-I, S-III
(B) P-I, Q-III, R-II, S-IV
(C) P-II, Q-I, R-IV, S-III
(D) P-IV, Q-II, R-III, S-I
(E) Answer not known

12. Read the given assertion and reason and select the correct option.
Assertion (A): The pancreas is referred to as a heterocrine or dual gland.
Reason (R): It has both exocrine acini that secrete digestive enzymes and endocrine islets that secrete hormones.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

13. Which of the following pairs concerning the transport of respiratory gases is incorrectly matched?
(A) Carbon monoxide - Has a lower affinity for haemoglobin than oxygen
(B) Oxygen - Transported mostly bound to haemoglobin
(C) Carbon dioxide - Transported mostly as bicarbonate ions in plasma
(D) Carbamino-haemoglobin - Combination of carbon dioxide with haemoglobin
(E) Answer not known

14. Consider the following statements about the mechanism of breathing:
I. During inspiration, the diaphragm contracts

Click Here to Buy book on Amazon

and flattens.
II. During expiration, the intercostal muscles relax, decreasing the thoracic volume.
III. Inspiration is a passive process while normal expiration is an active process.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) III only
(E) Answer not known

15. Consider the following statements regarding gas exchange in the alveoli:
I. The walls of the alveoli are extremely thin and highly vascularized.
II. Gas exchange occurs primarily by active transport requiring ATP.
III. Oxygen diffuses from the alveoli into the blood due to partial pressure differences.
IV. Carbon dioxide diffuses from the blood into the alveoli to be exhaled.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II and IV
(D) I and IV
(E) Answer not known

16. Select the correct sequence of the pathway of air into the human respiratory system.
(A) Nostrils, Pharynx, Larynx, Trachea, Bronchi, Bronchioles, Alveoli
(B) Nostrils, Larynx, Pharynx, Trachea, Bronchioles, Bronchi, Alveoli
(C) Nostrils, Pharynx, Trachea, Larynx, Bronchi, Bronchioles, Alveoli
(D) Nostrils, Trachea, Pharynx, Larynx, Bronchi, Alveoli, Bronchioles
(E) Answer not known

17. All of the following enzymes are secreted by the exocrine portion of the pancreas EXCEPT:
(A) Trypsinogen
(B) Pepsin
(C) Pancreatic amylase
(D) Pancreatic lipase
(E) Answer not known

18. What is the approximate normal tidal volume in a healthy human adult?
(A) 1000 mL to 1100 mL
(B) 2500 mL to 3000 mL
(C) 500 mL
(D) 150 mL
(E) Answer not known

19. In what form is the largest percentage of carbon dioxide transported in human blood?
(A) Bicarbonate ions
(B) Dissolved state in plasma
(C) Carbamino-haemoglobin
(D) Carbonic acid
(E) Answer not known

20. The actual site of gaseous exchange in the human lungs is the:
(A) Trachea
(B) Primary bronchi
(C) Alveoli
(D) Terminal bronchioles
(E) Answer not known

21. Match List I with List II regarding the structure of the human heart.
List I: (Chamber)
P. Right Atrium
Q. Right Ventricle
R. Left Atrium
S. Left Ventricle
List II: (Function)
I. Pumps deoxygenated blood to the lungs
II. Receives oxygenated blood from the lungs
III. Pumps oxygenated blood to the rest of the body
IV. Receives deoxygenated blood from the body
(A) P-IV, Q-I, R-II, S-III
(B) P-I, Q-IV, R-III, S-II
(C) P-IV, Q-II, R-I, S-III
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

22. Read the given assertion and reason and select the correct option.
Assertion (A): Arteries generally carry oxygenated blood away from the heart.
Reason (R): The pulmonary artery carries oxygenated blood from the right ventricle to the lungs.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct

NODIA

explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

23. Which of the following pairs relating to blood pressure is correctly matched?
(A) Systolic Pressure - Pressure during ventricular relaxation
(B) Normal Blood Pressure - 120/80 mm Hg
(C) Diastolic Pressure - Maximum pressure during ventricular contraction
(D) Hypertension - Sustained blood pressure below 90/60 mm Hg
(E) Answer not known

24. Consider the following statements about the cardiac cycle:
I. Atrial systole is the contraction of the auricles pushing blood into ventricles.
II. Ventricular systole occurs simultaneously with atrial systole.
III. Joint diastole is the relaxed state of all chambers of the heart.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II and III
(D) I only
(E) Answer not known

25. Consider the following statements about blood vessels:
I. Veins possess valves to prevent the backflow of blood.
II. Capillaries are thick-walled vessels that connect arteries and veins.
III. Arteries have thick, elastic walls to withstand high pressure.
IV. Exchange of materials between blood and tissues occurs at the capillary level.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II and IV
(D) I, II and IV
(E) Answer not known

26. Select the correct sequence of blood flow starting from the entry of deoxygenated blood into the heart.
(A) Right Atrium, Right Ventricle, Pulmonary Artery, Lungs, Pulmonary Vein, Left Atrium, Left Ventricle, Aorta
(B) Right Atrium, Left Atrium, Right Ventricle, Left Ventricle, Pulmonary Artery, Lungs, Aorta
(C) Left Atrium, Left Ventricle, Aorta, Body, Right Atrium, Right Ventricle, Pulmonary Artery, Lungs
(D) Right Ventricle, Right Atrium, Pulmonary Vein, Lungs, Pulmonary Artery, Left Ventricle, Left Atrium
(E) Answer not known

NODIA

27. Capillaries can be classified based on their structural characteristics. Which type is most common and forms a continuous tube without pores?
(A) Fenestrated capillaries
(B) Continuous capillaries
(C) Sinusoidal capillaries
(D) Lymphatic capillaries
(E) Answer not known

28. Comparing arteries and veins, which of the following features is predominantly characteristic of veins?
(A) Thick muscular walls
(B) Presence of internal valves
(C) High pressure blood flow
(D) Deep-seated location in the body
(E) Answer not known

29. Identify the incorrect statement regarding the measurement of blood pressure.
(A) Measuring the first tapping sound heard through a stethoscope as the diastolic pressure
(B) Utilizing a clinical sphygmomanometer as the primary instrument for measurement
(C) Measuring blood pressure routinely in the brachial artery located in the upper arm
(D) Defining normal systolic pressure level for a healthy adult as approximately 120 mm Hg
(E) Answer not known

30. The valve present between the right atrium and the right ventricle is an example of which category?
(A) Bicuspid valve
(B) Semilunar valve

CHAPTER 09

Physiology, Nutrition, Health and Hygiene

1. Match List I with List II regarding the levels of biological organisation.
List I: (Level)
P. Cell
Q. Tissue
R. Organ
S. Organ System
List II: (Description)
I. Heart and blood vessels working together
II. Basic structural and functional unit
III. Group of similar cells performing a specific function
IV. Distinct structure composed of two or more tissue types
(A) P-II, Q-III, R-IV, S-I
(B) P-III, Q-II, R-I, S-IV
(C) P-II, Q-IV, R-III, S-I
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

2. Read the given assertion and reason and select the correct option.
Assertion (A): The stomach lining secretes mucus to protect itself.
Reason (R): The gastric glands secrete hydrochloric acid which makes the gastric juice highly acidic and helps in the activation of pepsin.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

3. Which of the following pairs of digestive enzymes and their substrates is correctly matched?
(A) Lipase - Fats
(B) Amylase - Proteins
(C) Pepsin - Carbohydrates
(D) Trypsin - Lipids
(E) Answer not known

4. Consider the following statements regarding the functions of the human liver:
I. It produces bile, which helps in the emulsification of fats.
II. It plays a major role in the detoxification of drugs and alcohol.
III. It secretes insulin to regulate blood sugar levels.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

5. Consider the following statements about the human digestive process:
I. Digestion begins in the mouth with the action of salivary amylase.
II. Absorption of most nutrients occurs in the large intestine.
III. Assimilation involves the utilization of absorbed nutrients by body cells.
IV. The small intestine has villi that increase the surface area for absorption.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) I and IV
(C) II only
(D) II, III and IV
(E) Answer not known

6. Select the correct sequence of the organs in the human digestive tract through which food passes.
(A) Mouth, Oesophagus, Stomach, Small Intestine, Large Intestine, Rectum
(B) Mouth, Stomach, Oesophagus, Small Intestine, Large Intestine, Rectum
(C) Mouth, Oesophagus, Stomach, Large Intestine, Small Intestine, Rectum

Downloaded from www.pdf.tube

(C) Systemic regulation of internal body temperature through hypothalamus-mediated mechanisms
(D) Metabolic synthesis of essential amino acids required for protein production in the liver
(E) Answer not known

38. If a person travels to a desert and faces severe dehydration, what physiological response primarily aids in osmoregulation?
(A) Decreased secretion of ADH leading to dilute urine
(B) Increased glomerular filtration rate
(C) Decreased tubular reabsorption of water
(D) Increased secretion of ADH leading to concentrated urine
(E) Answer not known

39. An advantage of individuals with blood group 'O negative' is that they are universal donors, but what is a disadvantage?
(A) They have both A and B antigens, making them prone to autoimmune diseases
(B) They can only receive blood from other 'O negative' donors
(C) They lack antibodies in their plasma, reducing their immune response
(D) They possess the Rh antigen, limiting their donation capability to Rh positive individuals only
(E) Answer not known

40. The ABO blood grouping system in humans was discovered by which of the following scientists?
(A) William Harvey
(B) Gregor Mendel
(C) Karl Landsteiner
(D) Louis Pasteur
(E) Answer not known

41. Match List I with List II regarding parts of the brain and their functions.
List I: (Brain Part)
P. Cerebrum
Q. Cerebellum
R. Medulla Oblongata
S. Hypothalamus
List II: (Function)
I. Regulation of body temperature, hunger, and thirst
II. Control of involuntary actions like breathing and heartbeat
III. Seat of intelligence, memory, and voluntary motor action
IV. Maintenance of posture, balance, and coordination
(A) P-III, Q-IV, R-II, S-I
(B) P-IV, Q-III, R-I, S-II
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

42. Read the given assertion and reason and select the correct option.
Assertion (A): Reflex actions are rapid, involuntary responses to stimuli.
Reason (R): They are primarily controlled by the brain without involvement of the spinal cord to increase speed.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

43. Which of the following pairs distinguishing the Central Nervous System (CNS) and Peripheral Nervous System (PNS) is correctly matched?
(A) Brain - PNS
(B) Cranial Nerves - PNS
(C) Spinal Nerves - CNS
(D) Spinal Cord - PNS
(E) Answer not known

44. Consider the following statements about the structure of a neuron:
I. Dendrites receive electrical impulses from other neurons.
II. The axon is insulated by a myelin sheath in many neurons, speeding up impulse transmission.
III. The cell body (cyton) contains the nucleus but lacks other normal cellular organelles.
Which of the above statement(s) is/are incorrect?
(A) I and II
(B) II and III
(C) III only
(D) I and III
(E) Answer not known

NODIA

91. Match List I with List II regarding nutritional deficiency diseases and their primary symptoms.
List I: (Disease)
P. Kwashiorkor
Q. Marasmus
R. Rickets
S. Goitre
List II: (Symptom)
I. Swelling of the neck region
II. Bow legs and soft bones
III. Extreme wasting of muscles and loss of subcutaneous fat
IV. Oedema (swelling) of the belly and legs
(A) P-IV, Q-III, R-II, S-I
(B) P-III, Q-IV, R-I, S-II
(C) P-IV, Q-II, R-III, S-I
(D) P-I, Q-III, R-II, S-IV
(E) Answer not known

92. Read the given assertion and reason and select the correct option.
Assertion (A): Programs like the Mid-Day Meal Scheme have improved school enrollment and nutritional status.
Reason (R): These programs provide a guaranteed calorie and protein-rich meal, combating child malnutrition directly.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

93. Which of the following pairs of nutritional deficiency and its effect is incorrectly matched?
(A) Vitamin D deficiency - Night blindness
(B) Protein deficiency - Kwashiorkor
(C) Vitamin C deficiency - Scurvy
(D) Iron deficiency - Anaemia
(E) Answer not known

94. Consider the following statements about Protein Energy Malnutrition (PEM):
I. Kwashiorkor occurs when the diet is severely deficient in proteins but has adequate calories.
II. Marasmus is caused by a severe deficiency of both proteins and total calories.
III. Kwashiorkor affects children mostly between 1 to 5 years of age.
IV. Marasmus usually affects infants under 1 year of age.
V. A prominent symptom of Marasmus is the accumulation of fluid leading to a pot-belly.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) I, II, III and IV
(C) II, III, IV and V
(D) I, III and IV
(E) Answer not known

95. Arrange the following historical milestones of nutritional interventions in Tamil Nadu in chronological order of their launch.
I. Mid-Day Meal Scheme introduced by K. Kamaraj
II. Puratchi Thalaivar MGR Nutritious Meal Programme
III. Justice Party introduces free meals in Chennai Corporation schools
IV. Moovalur Ramamirtham Ammaiyar Pudhumai Penn Scheme
(A) III, I, II, IV
(B) I, III, II, IV
(C) III, II, I, IV
(D) I, II, III, IV
(E) Answer not known

96. All of the following are clinical manifestations of Kwashiorkor EXCEPT:
(A) Physiological edema or noticeable swelling of the lower and upper extremities
(B) Development of hepatomegaly, which refers to an abnormally enlarged liver
(C) Extreme muscle wasting resulting in a 'skin and bones' physical appearance
(D) Significant stunted physical growth and potential mental retardation in children
(E) Answer not known

97. Which of the following terms is most appropriately used to describe a chronic lack of essential vitamins and minerals that often shows no visible warning signs?
(A) Severe Acute Malnutrition
(B) Hidden Hunger
(C) Protein Energy Malnutrition
(D) Overnutrition
(E) Answer not known

Click Here to Buy book on Amazon

(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

53. Which of the following pairs of hormone deficiency and its corresponding disease is incorrectly matched?
(A) Vasopressin (ADH) - Diabetes Mellitus
(B) Insulin - Diabetes Mellitus
(C) Growth Hormone (in childhood) - Dwarfism
(D) Thyroxine (in adulthood) - Myxedema
(E) Answer not known

54. Consider the following statements distinguishing endocrine and exocrine glands:
I. Endocrine glands are ductless and pour their secretions directly into the blood.
II. Exocrine glands secrete enzymes or other substances through ducts.
III. Sweat and sebaceous glands are examples of endocrine glands.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

55. Consider the following physiological effects:
I. Increase in heart rate and blood pressure.
II. Dilation of pupils.
III. Decrease in the rate of respiration.
IV. Conversion of liver glycogen to glucose.
Which of these are caused by the release of adrenaline during emergency situations?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV
(E) Answer not known

56. Select the correct sequence representing the hormonal feedback mechanism for the thyroid gland.
(A) Hypothalamus (TRH) → Anterior Pituitary (TSH) → Thyroid Gland (Thyroxine)
(B) Anterior Pituitary (TSH) → Hypothalamus (TRH) → Thyroid Gland (Thyroxine)
(C) Thyroid Gland (Thyroxine) → Anterior Pituitary (TSH) → Hypothalamus (TRH)
(D) Hypothalamus (TSH) → Anterior Pituitary (TRH) → Thyroid Gland (Thyroxine)
(E) Answer not known

57. All of the following are actions of insulin EXCEPT:
(A) Promotes the conversion of glucose to glycogen in the liver
(B) Facilitates the uptake of glucose by cells
(C) Decreases the concentration of glucose in the blood
(D) Stimulates the breakdown of glycogen into glucose in the liver
(E) Answer not known

58. Which of the following hormones is most appropriately known as the 'Flight or Fight' hormone?
(A) Adrenaline
(B) Thyroxine
(C) Somatotropin
(D) Oxytocin
(E) Answer not known

59. When blood calcium levels fall, the parathyroid glands release parathyroid hormone (PTH) to increase blood calcium. Once levels are restored, PTH secretion stops. This is an example of:
(A) Positive feedback mechanism
(B) Negative feedback mechanism
(C) Nervous reflex action
(D) Synergistic hormonal effect
(E) Answer not known

NODIA

60. Based on their structural classification and mode of action, how are hormones generally categorized?
(A) As simple sugars and complex carbohydrates
(B) As peptides/proteins and steroids
(C) As saturated and unsaturated fatty acids
(D) As fat-soluble and water-soluble vitamins
(E) Answer not known

61. Match List I with List II regarding human reproductive organs and their functions.
List I: (Reproductive Organ)
P. Testis
Q. Ovary

Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II and IV
(D) I, II and IV
(E) Answer not known

76. Select the correct sequence of events leading to the synthesis and activation of Vitamin D in humans.
(A) Skin exposure to UV light → Liver conversion → Kidney conversion to active form
(B) Kidney conversion → Liver conversion → Skin exposure to UV light
(C) Liver conversion → Skin exposure to UV light → Kidney conversion
(D) Skin exposure to UV light → Kidney conversion → Liver conversion
(E) Answer not known

77. A patient presents with bleeding gums, delayed wound healing, and joint pain. These symptoms are most indicative of a deficiency in which nutrient?
(A) Vitamin C
(B) Vitamin A
(C) Vitamin B1
(D) Vitamin D
(E) Answer not known

78. What is a significant advantage of consuming unsaturated fats over saturated fats in a regular diet?
(A) Unsaturated fats have a longer shelf life and resist rancidity better
(B) Unsaturated fats provide more than double the calories per gram compared to saturated fats
(C) Unsaturated fats help lower 'bad' LDL cholesterol and reduce heart disease risk
(D) Unsaturated fats are the only fats that can synthesize complete proteins
(E) Answer not known

79. Which of the following are the fundamental building blocks of proteins?
(A) Fatty acids and glycerol
(B) Monosaccharides
(C) Nucleotides
(D) Amino acids
(E) Answer not known

80. How is the Vitamin B complex accurately defined in nutritional science?
(A) A single specific vitamin that primarily aids in the physiological process of blood clotting and coagulation
(B) A group of fat-soluble vitamins found exclusively in animal-based food products like meat and dairy
(C) A collection of water-soluble vitamins essential for cellular metabolism and energy production
(D) A synthetic chemical supplement used specifically to treat children suffering from bone conditions like rickets
(E) Answer not known

81. Match List I with List II regarding essential minerals and their physiological roles.
List I: (Mineral)
P. Calcium
Q. Iron
R. Iodine
S. Zinc
List II: (Role)
I. Component of hemoglobin for oxygen transport
II. Synthesis of thyroid hormones
III. Immune system function and wound healing
IV. Bone formation and muscle contraction
(A) P-IV, Q-I, R-II, S-III
(B) P-IV, Q-II, R-I, S-III
(C) P-I, Q-IV, R-III, S-II
(D) P-II, Q-III, R-I, S-IV
(E) Answer not known

82. Read the given assertion and reason and select the correct option.
Assertion (A): Severe dehydration can lead to a drop in blood pressure and hypovolemic shock.
Reason (R): Water loss significantly reduces blood volume, making the heart pump harder to circulate blood.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true

Downloaded from www.pdf.tube

that nourishes and protects sperm.
(C) Spermatogenesis occurs in the epididymis.
(D) Testosterone regulates the formation of sperms.
(E) Answer not known

69. Which of the following is a category of dietary fiber that acts as an indigestible complex carbohydrate, promoting bowel health?
(A) Cellulose
(B) Galactose
(C) Maltose
(D) Fructose
(E) Answer not known

70. For a person aiming to maintain a healthy diet, which of the following is the most relevant guideline regarding carbohydrate intake?
(A) Complete elimination of all forms of carbohydrates from the daily dietary intake to achieve weight loss
(B) Predominant consumption of refined sugars, processed sweets, and other simple carbohydrate sources
(C) Relying exclusively on fruit juices and liquid sugar sources to meet the body's carbohydrate requirements
(D) Selection of complex carbohydrates including whole grains, legumes, and various vegetables
(E) Answer not known

71. Match List I with List II regarding vitamins and their chemical names.
List I: (Vitamin)
P. Vitamin A
Q. Vitamin D
R. Vitamin E
S. Vitamin K
List II: (Chemical Name)
I. Tocopherol
II. Phylloquinone
III. Retinol
IV. Calciferol
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-IV, R-III, S-II
(E) Answer not known

72. Read the given assertion and reason and select the correct option.
Assertion (A): A severe deficiency of dietary protein in children leads to Kwashiorkor.
Reason (R): Proteins are essential for growth, tissue repair, and the synthesis of enzymes and hormones.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

NODIA

73. Which of the following pairs regarding fatty acids is incorrectly matched?
(A) Saturated Fat - Solid at room temperature
(B) Unsaturated Fat - Liquid at room temperature
(C) Essential Fatty Acids - Linoleic and Linolenic acid
(D) Trans Fat - Naturally healthy and highly recommended
(E) Answer not known

74. Consider the following statements about the functions of fats and lipids in the human body:
I. They serve as a concentrated source of stored energy.
II. They form a major structural component of cell membranes.
III. They are essential for the absorption of water-soluble vitamins.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

75. Consider the following characteristics of water-soluble vitamins:
I. They include Vitamin B complex and Vitamin C.
II. They are stored in large quantities in the liver.
III. Excess amounts are usually excreted in the urine.
IV. They are susceptible to destruction during cooking or processing.

R. Fallopian Tube
S. Uterus
List II: (Function)
I. Site of fertilization
II. Production of sperm and testosterone
III. Site of embryo implantation and development
IV. Production of ova, estrogen, and progesterone
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-III, S-I
(C) P-II, Q-IV, R-III, S-I
(D) P-I, Q-III, R-II, S-IV
(E) Answer not known

62. Read the given assertion and reason and select the correct option.
Assertion (A): Carbohydrates are considered the primary source of energy for the human body.
Reason (R): They are broken down into glucose, which undergoes cellular respiration to produce ATP efficiently.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

63. Which of the following pairs classifying nutrients is correctly matched?
(A) Macronutrient - Vitamins
(B) Micronutrient - Carbohydrates
(C) Micronutrient - Fats
(D) Macronutrient - Proteins
(E) Answer not known

64. Consider the following statements regarding female reproductive hormones:
I. Estrogen is responsible for the development of secondary sexual characters in females.
II. Progesterone prepares the uterus for pregnancy and maintains it.
III. Testosterone triggers ovulation in the middle of the menstrual cycle.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I only
(E) Answer not known

65. Consider the following carbohydrates:
I. Glucose
II. Sucrose
III. Starch
IV. Glycogen
Which of these are classified as polysaccharides?
(A) I, II and III
(B) II, III and IV
(C) III and IV
(D) I and IV
(E) Answer not known

66. Select the correct sequence representing the pathway of sperm from production to ejaculation.
(A) Seminiferous tubules, Epididymis, Vas deferens, Urethra
(B) Epididymis, Seminiferous tubules, Urethra, Vas deferens
(C) Seminiferous tubules, Vas deferens, Epididymis, Urethra
(D) Vas deferens, Seminiferous tubules, Epididymis, Urethra
(E) Answer not known

67. In a comparison between macronutrients and micronutrients, which statement is true?
(A) Macronutrients provide energy and structure, while micronutrients facilitate various biochemical reactions
(B) Macronutrients are required in minute quantities, while micronutrients are fundamentally required in large quantities daily
(C) Complex vitamins and various trace minerals are considered representative examples of essential macronutrients
(D) Structural proteins and storage fats act primarily as micronutrients for the maintenance of body tissues
(E) Answer not known

68. Identify the incorrect statement regarding the male reproductive system.
(A) The scrotum maintains the testes at a temperature slightly lower than body temperature.
(B) The prostate gland secretes an alkaline fluid

Click Here to Buy book on Amazon

(E) Answer not known

83. Which of the following pairs of mineral deficiency and its associated disease is correctly matched?
(A) Iron - Anaemia
(B) Calcium - Goitre
(C) Iodine - Osteoporosis
(D) Phosphorus - Night blindness
(E) Answer not known

84. Consider the following statements regarding the dietary guidelines for Indians proposed by the National Institute of Nutrition (NIN):
I. Consume a diet rich in whole grains and fresh vegetables.
II. Restrict the intake of refined sugars and excessive fats.
III. Ensure adequate intake of water for normal physiological functions.
IV. Replace all animal proteins entirely with plant-based supplements.
V. Adopt healthy cooking methods like steaming and boiling.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, III, IV and V
(D) I, II and IV
(E) Answer not known

85. Arrange the food groups from the base (highest intake) to the tip (lowest intake) of a typical balanced food pyramid.
I. Fats, oils, and sweets
II. Cereals, grains, and millets
III. Vegetables and fruits
IV. Milk, meat, and pulses
(A) II, III, IV, I
(B) II, IV, III, I
(C) III, II, IV, I
(D) I, IV, III, II
(E) Answer not known

86. What is the definition of a 'balanced diet'?
(A) A nutritional plan containing only high-protein and high-fat foods to promote rapid physical growth
(B) A restricted dietary regimen limited strictly to the consumption of raw fruits and organic vegetables
(C) A specific therapeutic diet that eliminates all forms of complex and simple carbohydrates
(D) A diet providing all essential nutrients in correct proportions for health maintenance
(E) Answer not known

87. Under normal physiological conditions, what is the approximate daily water requirement for a healthy adult to maintain proper hydration?
(A) 0.5 to 1 litre
(B) 2 to 3 litres
(C) 5 to 6 litres
(D) 8 to 10 litres
(E) Answer not known

88. Identify the correct statement regarding the role of minerals in the human body.
(A) Iron is crucial for the formation of thyroxine in the thyroid gland
(B) Iodine is a central component of the haemoglobin molecule
(C) Calcium and phosphorus are essential for the structural rigidity of bones and teeth
(D) Zinc primarily facilitates nerve impulse transmission across synapses
(E) Answer not known

89. Which distinct feature characterizes the role of Calcium in cellular functions outside of bone structure?
(A) It acts as the primary carrier for oxygen transport in red blood cells
(B) It is strictly required for the synthesis of all water-soluble vitamins
(C) It functions as the main digestive enzyme in the stomach
(D) It is essential for blood clotting and muscle contraction
(E) Answer not known

90. Osmoregulation in the human body is best conceptualized as the process of:
(A) Maintaining the balance of water and dissolved salts in body fluids
(B) Regulating the body temperature through sweating
(C) Breaking down complex proteins into amino acids
(D) Exchanging oxygen and carbon dioxide across alveolar membranes
(E) Answer not known

Downloaded from www.pdf.tube

45. Consider the following functions related to the nervous system:
I. Sneezing and coughing reflexes.
II. Maintenance of blood pressure.
III. Digestion rate control.
IV. Reasoning and logical thinking.
Which of these are controlled by the Medulla Oblongata?
(A) I, II and III
(B) II, III and IV
(C) I and IV
(D) I, III and IV
(E) Answer not known

46. Select the correct sequence of components in a typical reflex arc.
(A) Receptor, Sensory Neuron, Relay Neuron (in spinal cord), Motor Neuron, Effector
(B) Receptor, Motor Neuron, Relay Neuron (in brain), Sensory Neuron, Effector
(C) Effector, Motor Neuron, Spinal Cord, Sensory Neuron, Receptor
(D) Receptor, Relay Neuron (in spinal cord), Sensory Neuron, Motor Neuron, Effector
(E) Answer not known

47. What is the definition of a synapse in the nervous system?
(A) The fatty protective insulating covering found around the axon segment of a neuron
(B) A highly specialized glial cell responsible for the production of the myelin sheath
(C) The internal fluid-filled space located within the ventricles and subarachnoid space
(D) The junctional gap between the axon terminal of one neuron and the dendrite of the next
(E) Answer not known

48. A person meets with an accident and suddenly loses the ability to maintain body balance and walk in a straight line. Which part of the brain is most likely affected?
(A) Cerebrum
(B) Hypothalamus
(C) Cerebellum
(D) Medulla Oblongata
(E) Answer not known

49. Identify the correct statement regarding the autonomic nervous system.
(A) Anatomical structure consisting solely of the pairs of cranial nerves emerging from the brain
(B) Division into sympathetic and parasympathetic systems that produce antagonistic physiological effects
(C) Functional control system governing all voluntary skeletal muscle movements and conscious actions
(D) Regulatory system located entirely within the internal structures of the brain and brainstem
(E) Answer not known

50. What is a distinct anatomical feature of the human spinal cord compared to the human brain?
(A) The spinal cord has grey matter on the outside and white matter on the inside
(B) The spinal cord lacks a central canal
(C) The spinal cord is unprotected by meninges
(D) The spinal cord has white matter on the outside and grey matter on the inside
(E) Answer not known

NODIA

51. Match List I with List II regarding endocrine glands and their primary hormones.
List I: (Endocrine Gland)
P. Thyroid Gland
Q. Adrenal Gland
R. Pancreas (Islets of Langerhans)
S. Pituitary Gland
List II: (Hormone)
I. Adrenaline
II. Growth Hormone
III. Thyroxine
IV. Insulin
(A) P-III, Q-I, R-IV, S-II
(B) P-III, Q-IV, R-I, S-II
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

52. Read the given assertion and reason and select the correct option.
Assertion (A): The pituitary gland is often called the "master gland" of the endocrine system.
Reason (R): It secretes hormones that regulate the activity of other endocrine glands, although it is itself under the control of the hypothalamus.

98. Nutritional anaemias are often classified based on red blood cell morphology. Megaloblastic anaemia is primarily caused by the deficiency of which nutrients?
(A) Iron and Vitamin C
(B) Calcium and Vitamin D
(C) Protein and Zinc
(D) Vitamin B12 and Folic acid
(E) Answer not known

99. When comparing Kwashiorkor and Marasmus, which of the following statements is true?
(A) Edema is a hallmark feature of Kwashiorkor, whereas it is absent in Marasmus
(B) Both are caused solely by excessive intake of refined carbohydrates
(C) Marasmus only affects adults, while Kwashiorkor only affects infants
(D) Both conditions lead to hyperactivity and increased metabolic rates
(E) Answer not known

100. Identify the incorrect statement regarding malnutrition.
(A) Malnutrition includes both undernutrition and overnutrition.
(B) Obesity is considered a form of malnutrition.
(C) Undernutrition decreases the body's susceptibility to infectious diseases.
(D) Anemia is a common form of micronutrient malnutrition among Indian women.
(E) Answer not known

101. Match List I with List II regarding food preservation methods and their mechanisms.
List I: (Preservation Method)
P. Pasteurization
Q. Dehydration
R. Salting
S. Freezing
List II: (Mechanism)
I. Removes moisture to inhibit microbial growth
II. Draws out water by osmosis and inhibits bacteria
III. Slows down enzyme action and microbial growth at low temperatures
IV. Heats food to kill pathogens, then cools rapidly
(A) P-IV, Q-I, R-II, S-III
(B) P-III, Q-I, R-IV, S-II
(C) P-IV, Q-II, R-I, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

102. Read the given assertion and reason and select the correct option.
Assertion (A): Regular brushing of teeth is vital for dental hygiene.
Reason (R): Bacteria in the mouth break down sugar to produce acids, which can dissolve tooth enamel and cause caries.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

103. Which of the following pairs of food adulterants and their common target is incorrectly matched?
(A) Metanil yellow - Turmeric powder
(B) Chicory - Black pepper
(C) Argemone oil - Mustard oil
(D) Urea - Milk
(E) Answer not known

104. Consider the following statements about the Food Safety and Standards Authority of India (FSSAI):
I. It is an autonomous body established under the Ministry of Health & Family Welfare.
II. It is responsible for protecting and promoting public health through food safety regulation.
III. It grants licenses to food businesses across India.
IV. It enforces the Food Safety and Standards Act, 2006.
V. It regulates the manufacturing of pharmaceutical drugs in India.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III, IV and V
(D) I, II and IV
(E) Answer not known

105. Arrange the standard WHO steps for effective handwashing in the correct sequence.
I. Rub palms together with fingers interlaced

Click Here to Buy book on Amazon

II. Wet hands with water and apply soap
III. Rub the back of each hand with the palm of the other hand
IV. Rinse hands with water and dry thoroughly
(A) II, III, I, IV
(B) II, I, III, IV
(C) III, II, I, IV
(D) I, II, III, IV
(E) Answer not known

106. Which of the following is the most relevant practice for maintaining skin hygiene and preventing conditions like scabies or ringworm?
(A) Bathing regularly with soap and water and wearing clean, laundered clothes
(B) Washing the face repeatedly with ice-cold water on an hourly basis throughout the day
(C) Applying thick layers of moisturizing cosmetic creams to the skin before going to sleep
(D) Strict avoidance of exposure to any form of natural sunlight for extended periods
(E) Answer not known

107. From a food safety perspective, what can be inferred if a person uses the same cutting board to chop raw chicken and then immediately slices a cucumber for a salad?
(A) The sliced cucumber will absorb a higher concentration of proteins from the raw meat
(B) Significant risk of cross-contamination resulting in potential foodborne illness
(C) The overall nutritional value and vitamin content of both food items will increase
(D) Natural pasteurization of the cucumber surface occurs automatically during the slicing
(E) Answer not known

108. An advantage of the pasteurization of milk is that it kills pathogenic bacteria. What is a potential disadvantage?
(A) Permanent alteration of the natural white color of the milk to a distinct yellow shade
(B) Potential loss of minor amounts of heat-sensitive vitamins such as Vitamin C
(C) Immediate curdling and separation of the milk proteins upon reaching high temperatures
(D) Making the milk biologically unsafe for consumption by infants and young children
(E) Answer not known

109. The Food Safety and Standards Act, which consolidated various acts and orders that handled food related issues, was enacted in which year?
(A) 1954
(B) 1986
(C) 2006
(D) 2011
(E) Answer not known

110. How is 'personal hygiene' broadly defined in health science?
(A) The collective sanitation and waste management of a large community or city
(B) The industrial sterilization of medical equipment and surgical instruments
(C) Cleanliness practices performed by an individual to maintain bodily health and well-being
(D) The preventive use of broad-spectrum antibiotics to avoid the onset of viral infections
(E) Answer not known

NODIA

111. Match List I with List II regarding methods of water purification.
List I: (Purification Method)
P. Boiling
Q. Chlorination
R. Reverse Osmosis (RO)
S. UV Treatment
List II: (Mechanism)
I. Destroys the DNA of microbes using light rays
II. Removes heavy metals and dissolved salts through a semi-permeable membrane
III. Kills most pathogens by heating water to 100°C for several minutes
IV. Adds a chemical disinfectant to kill bacteria and viruses
(A) P-III, Q-IV, R-II, S-I
(B) P-IV, Q-III, R-I, S-II
(C) P-III, Q-I, R-II, S-IV
(D) P-I, Q-IV, R-III, S-II
(E) Answer not known

112. Read the given assertion and reason and select the correct option.
Assertion (A): Safe drinking water and proper

sanitation are essential to prevent diseases like cholera and typhoid.
Reason (R): These diseases are primarily water-borne and spread through fecal contamination of drinking water sources.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

113. Which of the following pairs regarding waste disposal methods is correctly matched?
(A) Composting - Dumping waste into oceans
(B) Incineration - Burning of solid waste at high temperatures
(C) Landfill - Converting biodegradable waste into biogas in a closed tank
(D) Recycling - Burying non-biodegradable waste underground
(E) Answer not known

114. Consider the following statements about Oral Rehydration Solution (ORS):
I. It is a simple, cost-effective treatment for dehydration caused by diarrhea.
II. It consists of a specific mixture of safe water, salt, and sugar.
III. It facilitates the co-transport of sodium and glucose in the intestine.
IV. It is an intravenous fluid administered directly into the bloodstream.
V. It completely cures the underlying bacterial infection causing the diarrhea.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II, III and V
(C) II, III, IV and V
(D) I, III and IV
(E) Answer not known

115. Arrange the standard steps of municipal water treatment in the correct sequence.
I. Filtration
II. Sedimentation
III. Disinfection (Chlorination)
IV. Coagulation and Flocculation
(A) IV, II, I, III
(B) II, IV, I, III
(C) I, II, IV, III
(D) IV, I, II, III
(E) Answer not known

116. What does the term 'potable water' define?
(A) Water that contains a high concentration of dissolved minerals for therapeutic use
(B) Water that has been used in agricultural irrigation
(C) Water that is safe for human consumption and free from harmful impurities
(D) Water collected directly from rainfall without purification
(E) Answer not known

117. In which year was the Swachh Bharat Mission (Gramin and Urban) officially launched by the Government of India to achieve universal sanitation coverage?
(A) 2012
(B) 2014
(C) 2016
(D) 2019
(E) Answer not known

118. Identify the correct statement regarding composting as a waste disposal method.
(A) It is best suited for disposing of electronic waste (e-waste)
(B) It involves the anaerobic breakdown of plastics
(C) It releases high levels of toxic dioxins into the atmosphere
(D) It transforms organic, biodegradable waste into nutrient-rich manure
(E) Answer not known

119. A key feature of the Reverse Osmosis (RO) water purification process is its ability to:
(A) Selectively adding essential minerals and vitamins to the water after purification
(B) Removal of dissolved inorganic solids and heavy metals such as arsenic and fluoride
(C) Functioning efficiently as a filtration system without the requirement for electricity
(D) Instantly boiling the water to a high temperature to destroy all resident viruses
(E) Answer not known

Downloaded from www.pdf.tube

120. The concept behind ORS (Oral Rehydration Solution) leverages a specific biological mechanism in the human body. What is it?
(A) The chemical breakdown and detoxification of harmful bacterial toxins within the liver
(B) The rapid multiplication and colonization of beneficial gut flora in the digestive tract
(C) Utilization of the sodium-glucose co-transport mechanism in the small intestine during illness
(D) The direct and immediate absorption of water through the mucosal lining of the stomach
(E) Answer not known

121. Match List I with List II regarding occupational dust exposure and the resulting pneumoconiosis.
List I: (Exposure)
P. Coal dust
Q. Silica dust
R. Asbestos fibers
S. Cotton dust
List II: (Disease)
I. Byssinosis
II. Asbestosis
III. Anthracosis (Black lung disease)
IV. Silicosis
(A) P-III, Q-IV, R-II, S-I
(B) P-IV, Q-III, R-I, S-II
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

122. Read the given assertion and reason and select the correct option.
Assertion (A): Prolonged exposure to high decibel noise in industries can cause permanent sensorineural hearing loss.
Reason (R): High-intensity sound waves damage the delicate hair cells in the cochlea of the inner ear.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

123. Which of the following pairs of industries and their typical occupational health hazards is correctly matched?
(A) Agricultural activities primarily leading to chronic lead poisoning in field workers
(B) Matchstick and firework manufacturing involving chemical and fire hazards
(C) Information Technology sectors resulting in the development of silicosis among employees
(D) Textile weaving and garment production leading to high levels of radiation exposure
(E) Answer not known

124. Consider the following statements regarding the prevention of occupational health hazards:
I. Providing Personal Protective Equipment (PPE) like masks, earplugs, and gloves.
II. Ensuring proper ventilation and exhaust systems in factories.
III. Regular medical check-ups and health monitoring for workers.
IV. Implementing ergonomic workplace designs.
V. Increasing the working hours to complete tasks faster, thereby reducing exposure days.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, III, IV and V
(C) II, III, IV and V
(D) I, II and III
(E) Answer not known

125. Arrange the first four limbs (Angas) of Ashtanga Yoga in their traditional sequential order as per Patanjali.
I. Asana
II. Yama
III. Pranayama
IV. Niyama
(A) II, IV, I, III
(B) I, II, III, IV
(C) II, I, IV, III
(D) IV, II, I, III
(E) Answer not known

126. All of the following are potential health effects of chronic noise pollution EXCEPT:
(A) Hypertension and cardiovascular issues
(B) Sleep disturbances
(C) Enhanced visual acuity

NODIA

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

(D) Increased stress and anxiety levels
(E) Answer not known

127. Which of the following is the most appropriate description of the 'Fit India Movement' launched by the Government of India?
(A) A government scheme designed to provide free high-quality sports equipment to all rural schools
(B) A professional recruitment program aimed at selecting elite athletes for Olympic competitions
(C) A restrictive dietary program aimed at substituting traditional food with protein supplements
(D) A nationwide campaign encouraging the inclusion of physical activity and sports in daily life
(E) Answer not known

128. Occupational health hazards can be classified into various types. Exposure to bacteria, viruses, or fungi by healthcare workers or laboratory personnel falls under which category?
(A) Physical hazards
(B) Chemical hazards
(C) Biological hazards
(D) Ergonomic hazards
(E) Answer not known

129. Comparing aerobic and anaerobic physical fitness exercises, which statement is true?
(A) Aerobic exercises are designed solely for building massive muscle mass, while anaerobic exercises are for fat loss
(B) Aerobic exercises use oxygen for energy and endurance, while anaerobic exercises involve high-intensity bursts
(C) Practicing Yoga is classified scientifically as a purely anaerobic form of physical exercise
(D) Anaerobic exercises fundamentally require a continuous and steady supply of oxygen for an extended time
(E) Answer not known

130. Identify the incorrect statement regarding the prevention of dust-related occupational hazards.
(A) Wet drilling and spraying water can significantly reduce dust generation
(B) Proper use of industrial-grade respirators protects workers from inhaling fine particles
(C) Regular cleaning of the workplace using vacuum methods instead of dry sweeping is recommended
(D) Workers should be encouraged to take meals inside the dusty work areas to save time
(E) Answer not known

131. Match List I with List II regarding abused substances and their physiological effects.
List I: (Substance)
P. Alcohol
Q. Tobacco (Nicotine)
R. Opiates (Heroin)
S. Cannabis (Marijuana)
List II: (Effect)
I. Depresses the central nervous system, relieves pain, induces sleep
II. Impairs liver function over time, affects coordination and judgment
III. Alters perception, affects short-term memory, and causes euphoria
IV. Stimulates adrenaline release, increases heart rate and blood pressure
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-III, S-I
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

132. Read the given assertion and reason and select the correct option.
Assertion (A): Chronic stress can lead to physical health issues such as hypertension, compromised immunity, and digestive problems.
Reason (R): Under prolonged stress, the body continuously secretes high levels of cortisol and adrenaline, disrupting normal physiological processes.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

133. Which of the following pairs relating to mental health disorders is incorrectly matched?
(A) Schizophrenia - Split personality where a person manifests two distinct identities
(B) Depression - Persistent feeling of sadness

Click Here to Buy book on Amazon

and loss of interest
(C) Anxiety - Excessive fear, worry, and nervousness
(D) Post-Traumatic Stress Disorder (PTSD) - Flashbacks and severe anxiety following a terrifying event
(E) Answer not known

134. Consider the following statements about the impact of chronic alcoholism on the human body:
I. It leads to fatty liver, alcoholic hepatitis, and eventually liver cirrhosis.
II. It impairs the nervous system, leading to memory loss and poor coordination.
III. It significantly increases the absorption of vitamins and minerals.
IV. It weakens the heart muscle, a condition known as alcoholic cardiomyopathy.
V. It can cause severe withdrawal symptoms like delirium tremens upon sudden cessation.
Which of the above statement(s) is/are correct?
(A) I, II, IV and V
(B) I, II, III and IV
(C) II, III, IV and V
(D) I, III and V
(E) Answer not known

135. Arrange the general stages of substance addiction development in the correct sequence.
I. Dependence (craving the substance to function normally)
II. Initial use or experimentation
III. Addiction (compulsive use despite harmful consequences)
IV. Tolerance (needing more of the substance to achieve the same effect)
(A) II, IV, I, III
(B) II, I, IV, III
(C) I, II, IV, III
(D) IV, II, I, III
(E) Answer not known

136. Which of the following substances belongs to the category of Central Nervous System (CNS) depressants?
(A) Cocaine
(B) Caffeine
(C) Alcohol
(D) Amphetamines
(E) Answer not known

137. Which of the following is the least relevant or effective strategy for managing severe mental health issues like clinical depression?
(A) Seeking professional help through counseling or therapy
(B) Engaging in regular physical exercise and mindfulness practices
(C) Medical intervention and prescribed medication by a psychiatrist
(D) Depending solely on willpower and ignoring the symptoms
(E) Answer not known

138. Based on health studies, what can be inferred about 'second-hand smoke' or passive smoking?
(A) It poses significant health risks, including lung cancer and respiratory infections, to non-smokers exposed to it
(B) It is completely harmless as the smoke has already been filtered by the active smoker's lungs
(C) It only affects adults and has no impact on children or infants
(D) It provides a mild stimulating effect similar to caffeine without any side effects
(E) Answer not known

NODIA

139. An advantage of incorporating mental health awareness programs in schools and workplaces is the reduction of stigma. What is a common disadvantage or challenge associated with these programs?
(A) These programs often cause individuals to develop mental illnesses that were not present
(B) Possible lack of trained professionals leading to superficial or incorrect guidance
(C) They are designed to permanently cure all serious mental health issues in one session
(D) They are intended to replace the need for physical fitness and exercise programs entirely
(E) Answer not known

140. What is the primary highly addictive alkaloid chemical found in tobacco that causes dependence?
(A) Tar
(B) Nicotine

(C) Carbon monoxide
(D) Formaldehyde
(E) Answer not known

141. Match List I with List II regarding digestive enzymes and their site of production.
List I: (Enzyme)
P. Salivary Amylase
Q. Pepsin
R. Bile salts
S. Trypsin
List II: (Site)
I. Stomach
II. Salivary Glands
III. Pancreas
IV. Liver
(A) P-II, Q-I, R-IV, S-III
(B) P-II, Q-IV, R-I, S-III
(C) P-I, Q-II, R-IV, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

142. Read the given assertion and reason and select the correct option.
Assertion (A): Vital capacity is a useful diagnostic measure of lung function.
Reason (R): It represents the total amount of air a person can exhale forcefully after a maximum inhalation.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

143. Which of the following pairs of brain lobes and their primary functions is correctly matched?
(A) Occipital lobe - Dedicated to hearing and advanced auditory processing functions
(B) Temporal lobe - Primary region for visual processing and image recognition
(C) Parietal lobe - Central hub for smell and taste sensory processing
(D) Frontal lobe - Responsible for reasoning, planning, and voluntary movement
(E) Answer not known

144. Consider the following statements about kidney functions and osmoregulation:

NODIA

I. Kidneys help maintain blood pH by excreting hydrogen ions.
II. Kidneys secrete erythropoietin which stimulates red blood cell production.
III. The Loop of Henle plays a crucial role in concentrating the urine.
IV. Dialysis acts as an artificial kidney in patients with renal failure.
V. The kidneys filter out essential plasma proteins into the urine under normal conditions.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III, IV and V
(D) I, II and IV
(E) Answer not known

145. Arrange the pathway of electrical conduction in the human heart in the correct sequence.
I. Bundle of His
II. SA Node (Sinoatrial node)
III. Purkinje Fibers
IV. AV Node (Atrioventricular node)
(A) II, IV, I, III
(B) IV, II, I, III
(C) II, I, IV, III
(D) I, II, III, IV
(E) Answer not known

146. How is residual volume functionally defined in respiratory physiology?
(A) The extra volume of air inspired over and above normal tidal volume
(B) The total volume of air the lungs can hold
(C) The volume of air breathed in during a normal resting breath
(D) The volume of air that remains in the lungs even after a forceful expiration
(E) Answer not known

147. What is considered the normal range for human resting heart rate (pulse rate)?
(A) 40 - 50 beats per minute
(B) 60 - 100 beats per minute
(C) 110 - 140 beats per minute
(D) 150 - 180 beats per minute
(E) Answer not known

148. Identify the correct statement regarding the cerebrum of the human brain.

ANSWERS

1. (A) P-II, Q-III, R-IV, S-I
The hierarchy of biological organization begins with the cell, representing the fundamental structural unit. Groups of specialized cells form tissues to perform specific tasks. Organs consist of different tissue types integrated into a distinct structure. Finally, organ systems comprise multiple organs working in coordination, such as the heart and vessels within the circulatory network.

2. (B) Both A and R are true but R is not the correct explanation of A
Gastric glands in the stomach lining secrete hydrochloric acid to activate pepsin and provide an acidic environment for protein digestion. Simultaneously, specialized goblet cells produce mucus to protect the stomach wall from self-digestion and corrosive damage. While both processes occur within the stomach, the production of acid does not directly explain why mucus is secreted.

3. (A) Lipase - Fats
Lipase is a specialized enzyme produced primarily by the pancreas and small intestine to break down dietary fats into fatty acids and glycerol. Amylase targets carbohydrates like starch, while enzymes like pepsin and trypsin are specific for proteins. Proper digestion depends on these specific enzyme-substrate pairings to ensure complex molecules are converted into absorbable forms.

4. (A) I and II
The liver performs vital roles including the production of bile for fat emulsification and the detoxification of harmful substances like drugs or alcohol. It also stores glycogen and synthesizes essential plasma proteins. However, the secretion of insulin is a function of the pancreas, specifically the islets of Langerhans, rather than a metabolic activity of the human liver.

5. (C) II only
Absorption of the majority of nutrients and water occurs in the small intestine through specialized structures called villi. The large intestine primarily absorbs remaining water and electrolytes while forming feces. Digestion does indeed initiate in the oral cavity via salivary amylase, and assimilation represents the subsequent utilization of these absorbed nutrients for cellular functions and energy production.

6. (A) Mouth, Oesophagus, Stomach, Small Intestine, Large Intestine, Rectum
Food enters the digestive system through the mouth and travels down the esophagus to the stomach for chemical breakdown. It then enters the small intestine for final digestion and absorption. Remaining waste moves through the large intestine, where water is reclaimed, before reaching the rectum for storage and eventual elimination through the anus in a systematic physiological process.

7. (B) Conversion of absorbed food into cellular structural and functional components
Assimilation is the biological process where nutrients absorbed from the digestive tract are incorporated into the actual living cells of the body. These molecules are utilized for energy production, tissue repair, and the synthesis of structural components. It follows the stages of digestion and absorption, representing the final step where nutrients become part of the body's functional architecture.

8. (C) Highly acidic environment
Pepsin is a proteolytic enzyme secreted by gastric glands in the stomach in an inactive form called pepsinogen. Hydrochloric acid provides the necessary highly acidic environment, typically around pH 1.5 to 2.5, to activate this enzyme. This acidity is crucial for unfolding protein chains, allowing pepsin to effectively break them down into smaller peptides and amino acids.

9. (D) Production of pancreatic juice containing digestive enzymes like trypsin and lipase
The exocrine portion of the pancreas consists of acinar cells that synthesize and secrete pancreatic

Downloaded from www.pdf.tube

(C) I, III, IV and V
(D) I, II and III
(E) Answer not known

155. Arrange the events of dietary fat digestion and absorption in the correct sequence.
I. Absorption into the lacteals (lymphatic vessels)
II. Action of pancreatic lipase breaking lipids into fatty acids and glycerol
III. Emulsification of large fat globules by bile salts
IV. Formation of chylomicrons in the intestinal cells
(A) III, II, IV, I
(B) II, III, I, IV
(C) III, IV, II, I
(D) I, II, III, IV
(E) Answer not known

156. How is malnutrition officially defined by the World Health Organization (WHO)?
(A) Defined exclusively as the inadequate intake of calories for the body's daily needs
(B) Deficiencies, excesses, or imbalances in an individual's intake of energy and nutrients
(C) The consumption of food far beyond the body's actual daily nutritional requirement
(D) The physiological state of being clinically overweight or morbidly obese
(E) Answer not known

157. The Food Safety and Standards Authority of India (FSSAI) became fully operational to enforce the unified food safety act in which year?
(A) 2006
(B) 2011
(C) 2015
(D) 2020
(E) Answer not known

158. Identify the correct statement regarding Kwashiorkor.
(A) A condition primarily caused by an extreme and chronic lack of carbohydrates in the diet
(B) Characterized by the severe loss of body fat leading to a shriveled and aged appearance
(C) Plump appearance due to edema masking underlying severe muscle wasting in children
(D) A disease that can be effectively treated by administering high doses of Vitamin C daily
(E) Answer not known

NODIA

159. A distinct feature of chlorination in the water purification process is that it:
(A) Filters out all dissolved heavy metals like lead and arsenic
(B) Removes large physical debris and suspended dirt particles
(C) Converts hard water into soft water by removing calcium ions
(D) Leaves a residual disinfectant that prevents re-contamination during distribution
(E) Answer not known

160. Body Mass Index (BMI) is a tool used in public health to assess nutritional status. How is it calculated?
(A) Weight in pounds divided by height in inches
(B) Height in centimeters minus weight in kilograms
(C) Weight in kilograms divided by height in meters squared
(D) Percentage of body fat divided by total body weight
(E) Answer not known

www.nodia.in

(A) It is anatomically defined as the smallest and least significant part of the brain
(B) It functions purely to regulate vital involuntary actions like heartbeat and respiration
(C) Consists of two hemispheres connected by a nerve fiber tract called the corpus callosum
(D) It is characterized by a complete lack of grey matter on its outer cerebral surface
(E) Answer not known

149. What is a defining anatomical feature of mature human erythrocytes (Red Blood Cells)?
(A) Biconcave shape lacking a nucleus to maximize space for haemoglobin
(B) Possession of a large, complex, and multi-lobed nucleus within the cell
(C) Being significantly larger in size than all types of circulating white blood cells
(D) Containing numerous mitochondria to facilitate high levels of aerobic respiration
(E) Answer not known

150. A patient presents with a swollen neck (goitre). Blood tests show low thyroxine levels but high Thyroid Stimulating Hormone (TSH) levels. This conceptualizes the failure of the:
(A) Inability of the pituitary gland to respond to TRH from the hypothalamus
(B) Failure of the hypothalamus to produce adequate TSH for thyroid stimulation
(C) Malfunction of the parathyroid gland in regulating systemic calcium levels
(D) Failure of the thyroid gland to produce thyroxine despite high stimulation
(E) Answer not known

151. Match List I with List II regarding B-complex vitamins.
List I: (Vitamin)
P. Vitamin B1
Q. Vitamin B2
R. Vitamin B3
S. Vitamin B12
List II: (Chemical Name)
I. Niacin
II. Cyanocobalamin
III. Thiamine
IV. Riboflavin
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

152. Read the given assertion and reason and select the correct option.
Assertion (A): Iron deficiency anemia is prevalent among adolescent girls and pregnant women in India.
Reason (R): Increased physiological demand for iron during growth and pregnancy is often not met by their regular diet.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true
(E) Answer not known

153. Which of the following pairs concerning health schemes in Tamil Nadu is correctly matched?
(A) Makkalai Thedi Maruthuvam - A program providing higher education scholarships to students
(B) Dr. Muthulakshmi Reddy Maternity Benefit Scheme - A system for providing old age pensions
(C) Chief Minister's Comprehensive Health Insurance Scheme - A plan for treating common seasonal colds
(D) Innuyir Kappom-Nammai Kaakkum 48 - Free road accident treatment for the first 48 hours
(E) Answer not known

154. Consider the following statements about the Swachh Bharat Mission (SBM):
I. It aims to achieve an Open Defecation Free (ODF) India.
II. It focuses on solid and liquid waste management.
III. It encourages behavioral change regarding healthy sanitation practices.
IV. It only targets urban areas and ignores rural sanitation.
V. It promotes the construction of household-owned and community-owned toilets.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V

Click Here to Buy book on Amazon

juice into the duodenum through ducts. This juice contains essential digestive enzymes including trypsin for proteins, lipase for fats, and amylase for carbohydrates. This differs from the endocrine function, which involves the direct secretion of hormones like insulin and glucagon into the bloodstream.

10. (A) Liver
The liver is the largest internal organ and the most significant metabolic center in the human body. It performs over five hundred essential functions, including protein synthesis, bile production, and glucose regulation. Situated in the upper right abdomen, it processes nutrients absorbed from the digestive tract, detoxifies harmful chemicals, and stores vital vitamins and minerals for systemic use.

11. (A) P-II, Q-IV, R-I, S-III
Tidal volume refers to the air exchanged during normal respiration, while vital capacity is the maximum air exhaled after deep inspiration. Residual volume is the air remaining in the lungs after forceful expiration to prevent alveolar collapse. Total lung capacity encompasses all air the respiratory system can hold, including the vital capacity and the non-expirable residual volume.

12. (A) Both A and R are true and R is the correct explanation of A
The pancreas is classified as a heterocrine or dual gland because it possesses both exocrine and endocrine tissues. The exocrine acini produce digestive enzymes that travel through ducts to the small intestine. Meanwhile, the endocrine islets of Langerhans secrete hormones like insulin and glucagon directly into the blood. This dual structure enables the organ to regulate both digestion and metabolism.

13. (A) Carbon monoxide - Has a lower affinity for haemoglobin than oxygen
Carbon monoxide actually possesses a significantly higher affinity for hemoglobin than oxygen, forming carboxyhemoglobin which prevents oxygen transport. Oxygen is primarily transported by binding to hemoglobin, while carbon dioxide travels mostly as bicarbonate ions in the plasma or as carbamino-hemoglobin. This high binding affinity of carbon monoxide makes it extremely dangerous as it causes tissue hypoxia and poisoning.

14. (A) I and II
During inspiration, the diaphragm and external intercostal muscles contract, increasing thoracic volume and drawing air into the lungs. Normal expiration is a passive process resulting from the relaxation of these muscles and the elastic recoil of the lungs. However, forced expiration can become an active process involving abdominal muscles. Statement three is incorrect because normal expiration does not require energy.

15. (B) I, III and IV
Alveoli provide a vast, thin, and highly vascularized surface area specifically designed for efficient gas exchange. This process occurs through passive diffusion driven by partial pressure gradients, rather than active transport using ATP. Oxygen moves from the air into the blood, while carbon dioxide moves from the blood into the alveoli, ensuring the oxygenation of tissues and removal of waste.

16. (A) Nostrils, Pharynx, Larynx, Trachea, Bronchi, Bronchioles, Alveoli
Inhaled air enters through the nostrils and passes through the pharynx and larynx before reaching the trachea. The trachea divides into bronchi, which further branch into smaller bronchioles within the lungs. Finally, the air reaches the alveoli, which are tiny air sacs where the exchange of oxygen and carbon dioxide occurs across the thin respiratory membrane and into the capillaries.

17. (B) Pepsin
The exocrine pancreas produces a variety of enzymes including trypsinogen, pancreatic amylase, and pancreatic lipase to facilitate the digestion of proteins, carbohydrates, and fats. Pepsin, however, is a protein-digesting enzyme secreted specifically by the gastric glands in the stomach lining. It requires an acidic environment to function, whereas pancreatic enzymes operate optimally in the alkaline conditions of the duodenum.

18. (C) 500 mL
Tidal volume is the specific amount of air that enters or leaves the lungs during a single cycle

NODIA

of normal, quiet breathing. In a healthy adult human, this volume is approximately five hundred milliliters. Of this total, about three hundred and fifty milliliters reach the alveoli for gas exchange, while the remaining volume occupies the anatomical dead space of the respiratory airways.

19. (A) Bicarbonate ions
Carbon dioxide is transported in the blood through three primary methods, but the largest portion, approximately seventy percent, travels as bicarbonate ions in the plasma. About twenty-three percent binds to hemoglobin as carbamino-hemoglobin, and a small fraction remains dissolved in the plasma. The conversion to bicarbonate is facilitated by the enzyme carbonic anhydrase within the red blood cells during circulation.

20. (C) Alveoli
The alveoli are the functional units of the respiratory system where the actual exchange of gases occurs. These microscopic, balloon-like sacs provide a massive surface area and are surrounded by a dense network of capillaries. The thinness of the alveolar and capillary walls allows oxygen and carbon dioxide to diffuse rapidly between the inhaled air and the blood based on partial pressure differences.

21. (A) P-IV, Q-I, R-II, S-III
The right atrium receives deoxygenated blood from the body, which the right ventricle then pumps to the lungs. Oxygenated blood returning from the lungs enters the left atrium. Finally, the left ventricle, which has the thickest muscular walls, pumps this oxygen-rich blood through the aorta to the rest of the body to meet the metabolic demands of the tissues.

22. (C) A is true but R is false
Arteries are blood vessels that typically carry oxygenated blood away from the heart to various body tissues. A notable exception to this rule is the pulmonary artery, which carries deoxygenated blood from the right ventricle to the lungs for oxygenation. Therefore, the statement in the reason is factually incorrect because the pulmonary artery does not carry oxygenated blood during circulation.

23. (B) Normal Blood Pressure - 120/80 mm Hg
Normal blood pressure in a healthy adult is traditionally measured as 120/80 mm Hg. Systolic pressure represents the maximum pressure during ventricular contraction, while diastolic pressure is the minimum pressure during ventricular relaxation. Hypertension refers to sustained high blood pressure, typically above 140/90 mm Hg. These measurements are essential indicators of cardiovascular health and the resistance within the arterial system.

24. (B) I and III
The cardiac cycle includes atrial systole, where the upper chambers contract to fill the ventricles, and joint diastole, where all four chambers are relaxed and filling with blood. Ventricular systole occurs after atrial systole, not simultaneously, to pump blood into the pulmonary artery and aorta. Therefore, only statements regarding atrial systole and joint diastole accurately describe the rhythmic events of the heart.

25. (B) I, III and IV
Veins contain internal valves to ensure one-way blood flow back to the heart, while arteries have thick, elastic walls to handle high pressure. Capillaries are extremely thin-walled, consisting of a single layer of endothelial cells, to facilitate the efficient exchange of gases and nutrients with tissues. Statement two is incorrect because capillaries are microscopic and thin-walled, rather than having thick walls.

26. (A) Right Atrium, Right Ventricle, Pulmonary Artery, Lungs, Pulmonary Vein, Left Atrium, Left Ventricle, Aorta
Deoxygenated blood enters the right atrium, passes to the right ventricle, and is pumped via the pulmonary artery to the lungs. After oxygenation, it returns through the pulmonary vein to the left atrium and left ventricle. Finally, the left ventricle pumps the oxygenated blood through the aorta to the systemic circulation. This sequence ensures the efficient separation and transport of respiratory gases.

27. (B) Continuous capillaries
Continuous capillaries are the most widespread type in the human body, found in muscles, skin, and the central nervous system. Their endothelial cells form an uninterrupted lining

Downloaded from www.pdf.tube

connected by tight junctions, creating a tube without large pores. This structure allows for the passage of small molecules like water and ions while restricting larger proteins and cells, thus maintaining a controlled internal environment.

28. (B) Presence of internal valves
Veins are characterized by the presence of internal valves that prevent the backflow of blood as it travels toward the heart under relatively low pressure. Unlike arteries, which have thick muscular walls and carry high-pressure blood, veins have thinner walls and a larger lumen. Most veins are located closer to the skin surface, whereas many major arteries are situated deep within the tissues.

29. (A) Measuring the first tapping sound heard through a stethoscope as the diastolic pressure
When measuring blood pressure using a sphygmomanometer and stethoscope, the first tapping sound heard represents the systolic pressure. This occurs when blood begins to flow through the compressed brachial artery. The point where the sounds disappear completely is recorded as the diastolic pressure. Therefore, the description of the first sound as diastolic is technically incorrect in the context of clinical blood pressure monitoring.

30. (C) Tricuspid valve
The tricuspid valve is situated between the right atrium and the right ventricle, consisting of three triangular flaps or cusps. Its primary function is to prevent the backflow of deoxygenated blood into the atrium when the right ventricle contracts. This differs from the bicuspid or mitral valve on the left side and the semilunar valves found at the base of major arteries.

31. (A) P-III, Q-II, R-IV, S-I
Plasma serves as the liquid matrix of the blood, transporting nutrients and waste. Erythrocytes, or red blood cells, are specialized for oxygen transport using hemoglobin. Leukocytes, the white blood cells, act as the body's primary defense mechanism against pathogens. Thrombocytes, known as platelets, are essential for the complex process of blood clotting and preventing excessive hemorrhage after an injury occurs.

32. (A) Both A and R are true and R is the correct explanation of A
Erythroblastosis fetalis is a severe hemolytic condition that can occur when an Rh-negative mother is sensitized to the Rh-positive blood of her fetus. The mother's immune system produces anti-Rh antibodies which can cross the placenta during subsequent pregnancies. These antibodies then attack and destroy the fetal red blood cells, leading to severe anemia or jaundice in the newborn, illustrating a classic immune incompatibility.

33. (B) Urinary Bladder - Synthesis of urea
The liver is the organ responsible for the synthesis of urea through the ornithine cycle, not the urinary bladder. The urinary bladder serves as a temporary storage reservoir for urine before it is eliminated. Kidneys perform the vital task of filtering blood, while ureters transport the resulting urine to the bladder and the urethra allows for its final discharge from the body.

NODIA

34. (B) II and III
The lymphatic system plays a critical role in immunity by filtering pathogens in lymph nodes and aids in nutrition by absorbing dietary fats in the small intestine through lacteals. Lymph actually contains significantly fewer proteins than blood plasma. Because statement one is false and statements two and three are true, the lymphatic system is essential for both fluid balance and defense.

35. (A) I, III and IV
Urine formation begins with non-selective glomerular filtration in the Bowman's capsule, followed by selective tubular reabsorption and secretion in the renal tubules. Tubular secretion is vital for maintaining ionic balance and pH. Antidiuretic hormone further regulates water reabsorption in the collecting ducts to maintain osmoregulation. Statement two is incorrect because reabsorption occurs primarily in the proximal convoluted tubule, not the capsule.

36. (A) Bowman's capsule, Proximal Convoluted Tubule, Loop of Henle, Distal Convoluted Tubule, Collecting Duct
The filtrate produced in the glomerulus enters the Bowman's capsule and flows into the proximal convoluted tubule for significant reabsorption.

It then travels through the Loop of Henle, which establishes an osmotic gradient, and the distal convoluted tubule for further adjustment. Finally, the processed fluid enters the collecting duct, where final water reabsorption occurs before the urine is transported toward the ureters.

37. (A) Filtration of blood and storage of red blood cells within the splenic reservoir
The spleen is a vital lymphoid organ that acts primarily as a blood filter, removing old or damaged red blood cells and capturing pathogens. It also serves as a significant reservoir for blood, which can be released into circulation during emergencies like hemorrhage. While it plays a role in the immune response, it does not produce digestive enzymes or regulate body temperature.

38. (D) Increased secretion of ADH leading to concentrated urine
During severe dehydration, the hypothalamus detects increased blood osmolarity and triggers the release of antidiuretic hormone from the posterior pituitary. This hormone increases the permeability of the collecting ducts in the kidneys, leading to significant water reabsorption back into the blood. Consequently, the body produces a smaller volume of highly concentrated urine to conserve essential fluids and maintain proper physiological balance.

39. (B) They can only receive blood from other 'O negative' donors
Individuals with O-negative blood are considered universal donors because their red blood cells lack A, B, and Rh antigens, preventing transfusion reactions in recipients. However, their plasma contains anti-A, anti-B, and anti-Rh antibodies. This means they can only safely receive blood from other O-negative donors, as any other blood type would trigger a potentially fatal immune response by attacking the donor cells.

40. (C) Karl Landsteiner
The ABO blood group system was discovered by Karl Landsteiner in 1900, a landmark achievement that made blood transfusions significantly safer. He identified the presence of specific antigens on the surface of red blood cells and corresponding antibodies in the plasma. For this vital contribution to medicine and biology, which explained the causes of transfusion reactions, Landsteiner was awarded the Nobel Prize.

41. (A) P-III, Q-IV, R-II, S-I
The cerebrum is the seat of intelligence and voluntary action, while the cerebellum maintains balance and coordination. The medulla oblongata regulates vital involuntary functions like breathing and heart rate. The hypothalamus serves as the primary control center for homeostasis, regulating temperature, hunger, and thirst. Together, these regions ensure the integrated functioning of the central nervous system and the entire human body.

42. (C) A is true but R is false
Reflex actions are indeed rapid and involuntary responses to specific stimuli, designed to protect the body from immediate harm. However, the reason is incorrect because many reflexes, known as spinal reflexes, are controlled primarily by the spinal cord rather than the brain to ensure maximum speed. While the brain receives sensory information later, it is not always the primary controller of the reflex.

43. (B) Cranial Nerves - PNS
The central nervous system consists exclusively of the brain and the spinal cord, serving as the main processing and control center. The peripheral nervous system includes all the nerves that branch out from the CNS, specifically the twelve pairs of cranial nerves and thirty-one pairs of spinal nerves. Therefore, cranial nerves are correctly classified as part of the peripheral nervous system's anatomical structure.

44. (C) III only
Dendrites are specialized to receive signals, while the axon conducts electrical impulses, often aided by an insulating myelin sheath for faster transmission. The cell body, or cyton, is the metabolic heart of the neuron and contains a nucleus along with standard cellular organelles like mitochondria and ribosomes. Statement three is incorrect because the cell body possesses all the typical organelles required for protein synthesis.

45. (A) I, II and III
The medulla oblongata is a critical part of the brainstem that governs several vital involuntary

Click Here to Buy book on Amazon

functions. These include the regulation of heart rate, blood pressure, and the rate of breathing, as well as reflex actions like sneezing, coughing, and swallowing. Advanced cognitive tasks such as reasoning and logical thinking are functions of the cerebral cortex rather than the primitive centers of the medulla.

46. (A) Receptor, Sensory Neuron, Relay Neuron (in spinal cord), Motor Neuron, Effector
A typical reflex arc begins with a receptor detecting a stimulus, which generates an impulse in a sensory neuron. This signal travels to the spinal cord, where a relay neuron processes the information and transfers it to a motor neuron. The motor neuron then carries the command to an effector, such as a muscle or gland, resulting in an immediate and automatic response.

47. (D) The junctional gap between the axon terminal of one neuron and the dendrite of the next
A synapse is the functional junction or microscopic gap between the axon terminal of one neuron and the dendrite or cell body of the next. Communication across this gap is typically achieved through the release of chemical messengers called neurotransmitters. This arrangement allows for the precise and one-way transmission of electrical signals throughout the complex network of the nervous system and body.

48. (C) Cerebellum
The cerebellum, located at the back of the brain, is primarily responsible for coordinating voluntary movements, maintaining posture, and ensuring equilibrium. If this region is damaged, an individual may experience significant difficulty with motor control, resulting in an unsteady gait and an inability to perform precise movements or maintain physical balance. The cerebrum and medulla govern different cognitive and vital functions.

49. (B) Division into sympathetic and parasympathetic systems that produce antagonistic physiological effects
The autonomic nervous system is a functional division of the peripheral nervous system that regulates involuntary bodily functions. it consists of the sympathetic system, which prepares the body for stressful 'fight or flight' situations, and the parasympathetic system, which promotes 'rest and digest' activities. These two systems generally work antagonistically to maintain internal homeostasis and respond to changing environmental or internal conditions.

50. (D) The spinal cord has white matter on the outside and grey matter on the inside
In the human spinal cord, the distribution of neural tissue is characterized by white matter on the periphery and grey matter in the center, often resembling a butterfly shape. This is the opposite of the brain, where the grey matter forms the outer cortex. The spinal cord is protected by the vertebral column and three layers of meninges, and contains a central canal.

51. (A) P-III, Q-I, R-IV, S-II
The thyroid gland produces thyroxine to regulate metabolism, while the adrenal glands secrete adrenaline during stress. The islets of Langerhans in the pancreas produce insulin to control blood glucose levels. The pituitary gland, situated at the base of the brain, secretes growth hormone among others. These hormones are vital chemical messengers that regulate various physiological processes and maintain internal homeostasis throughout life.

52. (A) Both A and R are true and R is the correct explanation of A
The pituitary gland is traditionally called the master gland because its hormones control the functions of other major endocrine glands, such as the thyroid and adrenals. However, its own activity is precisely regulated by the hypothalamus, which acts as the primary link between the nervous and endocrine systems. This hierarchy ensures that hormonal signals are accurately coordinated in response to the body's needs.

53. (A) Vasopressin (ADH) - Diabetes Mellitus
A deficiency of vasopressin, also known as antidiuretic hormone, leads to diabetes insipidus, characterized by excessive thirst and large volumes of dilute urine. Diabetes mellitus is caused by a deficiency or resistance to insulin, which affects glucose metabolism. Growth hormone deficiency in childhood causes dwarfism, and adult thyroxine deficiency leads

Downloaded from www.pdf.tube

to myxedema, making the pairing of vasopressin with diabetes mellitus incorrect.

54. (A) I and II
Endocrine glands are ductless structures that release hormones directly into the bloodstream for transport to distant target organs. Conversely, exocrine glands, such as sweat, salivary, and sebaceous glands, utilize ducts to deliver their secretions to specific internal or external surfaces. Statement three is incorrect because sweat and sebaceous glands are typical examples of exocrine glands, not endocrine ones as claimed.

55. (B) I, II and IV
Adrenaline, released during emergency situations, prepares the body for rapid action by increasing heart rate, dilating pupils, and stimulating the liver to convert glycogen into glucose for immediate energy. It also increases the rate and depth of respiration to enhance oxygen delivery. Statement three is incorrect because adrenaline increases, rather than decreases, the rate of respiration to meet heightened metabolic demands.

56. (A) Hypothalamus (TRH) → Anterior Pituitary (TSH) → Thyroid Gland (Thyroxine)
The regulation of thyroid function begins with the hypothalamus secreting thyrotropin-releasing hormone, which stimulates the anterior pituitary to release thyroid-stimulating hormone. TSH then prompts the thyroid gland to produce thyroxine. As thyroxine levels in the blood rise, they provide negative feedback to the hypothalamus and pituitary to inhibit further secretion, thereby maintaining a stable and appropriate level of the metabolic hormone.

57. (D) Stimulates the breakdown of glycogen into glucose in the liver
Insulin is a hypoglycemic hormone that lowers blood glucose levels by promoting its uptake into cells and stimulating the conversion of excess glucose into stored glycogen in the liver. It does not stimulate the breakdown of glycogen into glucose; that is the role of glucagon, an antagonistic hormone produced by the alpha cells of the pancreas to raise blood sugar when needed.

NODIA

58. (A) Adrenaline
Adrenaline, also known as epinephrine, is secreted by the adrenal medulla in response to acute stress or danger. It rapidly triggers physiological changes such as increased heart rate, elevated blood pressure, and diverted blood flow to muscles, preparing the individual to either face the threat or flee from it. This comprehensive response is why it is universally recognized as the 'fight or flight' hormone.

59. (B) Negative feedback mechanism
The regulation of blood calcium levels by parathyroid hormone is a classic example of a negative feedback mechanism. In this process, the output of the system—increased blood calcium—acts to inhibit the initial stimulus—PTH secretion. This ensures that calcium levels are maintained within a very narrow physiological range, preventing both deficiency and excess, which is vital for nerve and muscle function.

60. (B) As peptides/proteins and steroids
Hormones are generally classified into two main structural categories: peptides or proteins and steroids. Peptide hormones, like insulin and growth hormone, are water-soluble and bind to surface receptors. Steroid hormones, such as estrogen and testosterone, are lipid-soluble and can pass through cell membranes to act on internal receptors. This classification is fundamental to understanding how different hormones exert their specific biological effects.

61. (A) P-II, Q-IV, R-I, S-III
Testes produce sperm and testosterone, while ovaries produce ova and female sex hormones. The fallopian tubes are the specific site where fertilization typically occurs. The uterus provides the necessary environment for the implantation and development of the embryo into a fetus. Each organ plays a specialized and essential role in the complex process of human reproduction and the continuation of the species.

62. (A) Both A and R are true and R is the correct explanation of A
Carbohydrates are the body's primary and most readily available source of energy. During digestion, they are broken down into simple sugars like glucose, which cells then utilize

during aerobic respiration to generate adenosine triphosphate. ATP serves as the universal energy currency for cellular activities, making carbohydrates indispensable for maintaining metabolic functions and supporting physical activity in a highly efficient manner.

63. (D) Macronutrient - Proteins
Macronutrients are required by the body in large quantities and include carbohydrates, proteins, and fats, providing both energy and structural materials. Micronutrients, such as vitamins and minerals, are needed in much smaller amounts to facilitate essential biochemical reactions. Since proteins are needed in significant gram amounts daily for tissue building and repair, they are correctly classified as a vital category of macronutrients.

64. (A) I and II
Estrogen promotes the development of female secondary sexual characteristics, while progesterone is essential for preparing and maintaining the uterine lining for potential pregnancy. Testosterone is primarily a male sex hormone and is not responsible for triggering ovulation; instead, a surge in luteinizing hormone from the pituitary gland induces the release of an egg. Therefore, only the statements concerning estrogen and progesterone are correct.

65. (C) III and IV
Polysaccharides are complex carbohydrates composed of long chains of monosaccharide units. Starch is the primary storage form of energy in plants, while glycogen serves as the storage form in animals, particularly in the liver and muscles. Glucose is a monosaccharide, and sucrose is a disaccharide. Consequently, starch and glycogen are the only substances in the list correctly classified as polysaccharides in biology.

66. (A) Seminiferous tubules, Epididymis, Vas deferens, Urethra
Sperm cells are produced through spermatogenesis in the seminiferous tubules of the testes. They then move to the epididymis for maturation and storage. During ejaculation, sperm travel through the vas deferens, receive secretions from various glands to form semen, and are finally expelled from the body through the urethra. this sequential pathway is essential for the successful delivery of male gametes.

67. (A) Macronutrients provide energy and structure, while micronutrients facilitate various biochemical reactions
Macronutrients like carbohydrates and proteins provide the bulk of dietary energy and the building blocks for body tissues. In contrast, micronutrients such as vitamins and minerals are required in trace amounts to act as cofactors and regulators of various metabolic and physiological processes. This functional distinction highlights the complementary roles both nutrient classes play in maintaining overall human health and biological function.

68. (C) Spermatogenesis occurs in the epididymis.
Spermatogenesis, the process of sperm production, occurs within the seminiferous tubules of the testes, not the epididymis. The epididymis serves as a site for the maturation and temporary storage of sperm. The scrotum provides the necessary temperature regulation for healthy sperm development, and the prostate gland contributes alkaline fluid to semen, while testosterone is crucial for regulating the entire process of sperm formation.

69. (A) Cellulose
Cellulose is a complex polysaccharide found in the cell walls of plants that humans cannot digest due to the lack of necessary enzymes. It serves as an essential form of dietary fiber, adding bulk to the stool and promoting regular bowel movements and gut health. Unlike simple sugars like fructose or galactose, cellulose passes through the digestive tract relatively unchanged, providing significant physiological benefits.

70. (D) Selection of complex carbohydrates including whole grains, legumes, and various vegetables
For a healthy and balanced diet, it is recommended to prioritize the consumption of complex carbohydrates found in whole grains, legumes, and vegetables. These foods provide sustained energy release and essential dietary fiber. Conversely, one should limit refined sugars and processed carbohydrates, which cause rapid blood glucose spikes. Complete elimination of carbohydrates is generally not advisable as they are the body's primary fuel source.

Click Here to Buy book on Amazon

71. (A) P-III, Q-IV, R-I, S-II
Vitamin A is chemically known as retinol, which is essential for vision and skin health. Vitamin D, or calciferol, regulates calcium absorption and bone density. Vitamin E is tocopherol, serving as a potent antioxidant, while Vitamin K is phylloquinone, which is vital for the blood clotting process. Understanding these chemical names is fundamental in nutritional science and for identifying specific vitamin functions in the human body.

72. (B) Both A and R are true but R is not the correct explanation of A
Kwashiorkor is a specific form of severe malnutrition caused by an acute deficiency of dietary protein despite adequate caloric intake. Proteins are indeed fundamental for growth, tissue repair, and the production of enzymes and hormones. While both statements are factually correct, the general function of proteins does not specifically explain the unique pathological features of Kwashiorkor, such as edema, compared to other deficiency diseases.

73. (D) Trans Fat - Naturally healthy and highly recommended
Trans fats are primarily industrial byproducts of partial hydrogenation and are widely considered unhealthy, as they increase 'bad' LDL cholesterol and the risk of heart disease. Saturated fats are typically solid at room temperature, while unsaturated fats are liquid. Essential fatty acids, which the body cannot synthesize, include linoleic and linolenic acids. Therefore, labeling trans fats as naturally healthy and recommended is incorrect.

74. (A) I and II
Fats and lipids are essential for storing concentrated energy and forming the fundamental structural components of all cellular membranes. They also provide insulation and protect vital organs. However, they are required specifically for the absorption of fat-soluble vitamins (A, D, E, and K), rather than water-soluble ones like Vitamin C or the B-complex. Thus, only the first two statements are accurate descriptions.

75. (B) I, III and IV
Water-soluble vitamins, including the B complex and Vitamin C, are not stored in large amounts in the body; instead, excess quantities are typically excreted through the urine. They are also sensitive to heat and light, making them susceptible to destruction during food preparation. Because the body lacks significant storage capacity for these nutrients, they must be consumed regularly through the diet to maintain health.

76. (A) Skin exposure to UV light → Liver conversion → Kidney conversion to active form
The synthesis of active Vitamin D begins when skin exposure to ultraviolet light converts a precursor into cholecalciferol. This substance then undergoes the first stage of hydroxylation in the liver to become calcidiol. Finally, it is transported to the kidneys, where a second hydroxylation occurs to produce calcitriol, the physiologically active form of the vitamin that regulates calcium and phosphate levels in the body.

NODIA

77. (A) Vitamin C
Bleeding gums, delayed wound healing, and joint pain are the classic clinical symptoms of scurvy, which results from a severe and prolonged deficiency of Vitamin C. This vitamin is essential for the synthesis of collagen, a structural protein required for healthy connective tissues, skin, and blood vessels. Without adequate Vitamin C, the integrity of these tissues fails, leading to the observed symptoms of scurvy.

78. (C) Unsaturated fats help lower 'bad' LDL cholesterol and reduce heart disease risk
Consuming unsaturated fats in place of saturated fats is beneficial because they help lower 'bad' LDL cholesterol levels while maintaining or increasing 'good' HDL cholesterol. This shift reduces the overall risk of developing atherosclerosis and cardiovascular diseases. Saturated fats, often found in animal products, tend to raise cholesterol and contribute to arterial plaque formation, making unsaturated fats a healthier dietary choice.

79. (D) Amino acids
Amino acids are the fundamental building blocks of all proteins. There are twenty different amino acids that combine in various sequences to form the complex three-dimensional structures of proteins, which perform diverse roles including catalysis, transport, and structural support.

Essential amino acids must be obtained from the diet because the body cannot synthesize them, highlighting the importance of consuming varied protein sources regularly.

80. (C) A collection of water-soluble vitamins essential for cellular metabolism and energy production
The Vitamin B complex is accurately defined as a group of eight distinct water-soluble vitamins that work together to facilitate cellular metabolism and energy production. These include thiamine, riboflavin, niacin, and others, each playing a specific role in biochemical reactions such as the breakdown of carbohydrates or the synthesis of DNA. Because they are water-soluble, they require regular intake from dietary sources.

81. (A) P-IV, Q-I, R-II, S-III
Calcium is essential for bone structure and muscle contraction, while iron is a core component of hemoglobin for oxygen transport. Iodine is required by the thyroid gland to synthesize metabolic hormones, and zinc plays a vital role in immune function and wound healing. These minerals are indispensable micronutrients that the body needs in small but consistent amounts to maintain diverse physiological systems.

82. (A) Both A and R are true and R is the correct explanation of A
Severe dehydration significantly decreases the total volume of blood circulating in the body, a condition known as hypovolemia. This reduction in volume causes a drop in blood pressure and can lead to hypovolemic shock, where the heart is unable to pump enough blood to vital organs. The body's attempt to compensate by increasing heart rate and systemic resistance illustrates how fluid loss directly impacts cardiovascular stability.

83. (A) Iron - Anaemia
Iron deficiency is the leading cause of nutritional anemia, as it prevents the body from producing enough hemoglobin to transport oxygen effectively in the blood. Iodine deficiency leads to goiter, while calcium deficiency is associated with osteoporosis and rickets. Vitamin A deficiency causes night blindness, rather than phosphorus. Therefore, the pairing of iron deficiency with anemia is the only correctly matched option in the list.

84. (A) I, II, III and V
The National Institute of Nutrition recommends a balanced diet rich in whole grains, fruits, and vegetables, while limiting sugars and fats. Adequate water intake and healthy cooking methods like steaming are also encouraged to preserve nutrients. However, there is no guideline suggesting the total replacement of animal proteins with plant supplements; instead, a variety of protein sources is generally recommended for nutritional adequacy.

85. (A) II, III, IV, I
A traditional food pyramid is structured with cereals and grains at the broad base, representing the highest recommended daily intake. The next level includes vegetables and fruits, followed by protein-rich foods like milk, meat, and pulses. The narrow tip contains fats, oils, and sweets, which should be consumed sparingly. This visual arrangement guides individuals in selecting the correct proportions of different food groups for health maintenance.

86. (D) A diet providing all essential nutrients in correct proportions for health maintenance
A balanced diet is defined as one that provides all the essential nutrients—carbohydrates, proteins, fats, vitamins, and minerals—in the correct proportions and quantities required for maintaining health, growth, and overall well-being. It also includes adequate water and dietary fiber. Such a diet prevents nutritional deficiencies and reduces the risk of chronic diseases by ensuring the body receives everything it needs to function optimally.

87. (B) 2 to 3 litres
To maintain proper hydration and support normal physiological functions, a healthy adult typically requires approximately two to three liters of water daily under normal conditions. This requirement can vary based on factors such as physical activity levels, climate, and overall health status. Water is essential for temperature regulation, nutrient transport, and the elimination of metabolic waste products through the kidneys and skin surface.

88. (C) Calcium and phosphorus are essential for the structural rigidity of bones and teeth
Calcium and phosphorus are the primary minerals responsible for providing structural

Downloaded from www.pdf.tube

fingers and thoroughly scrubbing the back of each hand with the opposite palm. Finally, the hands are rinsed with water and dried completely. This systematic sequence is recommended by health organizations like the WHO to remove pathogens and prevent the spread of infectious disease.

106. (A) Bathing regularly with soap and water and wearing clean, laundered clothes
Maintaining skin hygiene is essential for preventing various infections, including parasitic conditions like scabies and fungal issues like ringworm. The most effective practice involves regular bathing with soap and water to remove dirt, sweat, and microbes, combined with wearing clean and properly laundered clothing. Cosmetic treatments and avoiding sunlight do not address the fundamental need to eliminate pathogens from the skin surface.

107. (B) Significant risk of cross-contamination resulting in potential foodborne illness
Using the same cutting board for raw poultry and then for vegetables without thorough cleaning presents a significant risk of cross-contamination. Pathogenic bacteria, such as Salmonella or Campylobacter, can be transferred from the raw meat to the ready-to-eat cucumber. This practice is a major cause of foodborne illnesses, as the vegetables are typically consumed without further cooking that would normally kill harmful microorganisms.

108. (B) Potential loss of minor amounts of heat-sensitive vitamins such as Vitamin C
While pasteurization is highly effective at destroying harmful pathogens in milk, the heat applied during the process can lead to the minor degradation of some heat-sensitive nutrients. Specifically, small amounts of Vitamin C and certain B vitamins may be lost. However, this is considered an acceptable tradeoff for the significant increase in food safety and the prevention of diverse milk-borne diseases.

109. (C) 2006
The Food Safety and Standards Act was enacted in 2006 to consolidate various older laws and orders related to food safety into a single, comprehensive regulatory framework. This act established the Food Safety and Standards Authority of India (FSSAI) to set science-based standards for food and regulate its manufacture, storage, distribution, and sale. It represents a major milestone in ensuring food quality.

110. (C) Cleanliness practices performed by an individual to maintain bodily health and well-being
Personal hygiene is broadly defined in health science as the set of cleanliness practices performed by an individual to maintain their own bodily health and prevent disease. These practices include regular handwashing, bathing, dental care, and wearing clean clothes. Effective personal hygiene is a cornerstone of public health, as it significantly reduces the transmission of pathogens between individuals and promotes overall well-being.

111. (A) P-III, Q-IV, R-II, S-I
Boiling is a simple method to kill pathogens at high temperatures, while chlorination uses chemical disinfectants to sanitize water. Reverse osmosis utilizes a semi-permeable membrane to remove dissolved salts and heavy metals. Ultraviolet treatment effectively neutralizes microorganisms by damaging their DNA with light rays. These methods are essential for transforming contaminated sources into safe, potable water suitable for human daily consumption.

NODIA

112. (A) Both A and R are true and R is the correct explanation of A
Access to safe drinking water and effective sanitation systems is vital for the prevention of water-borne diseases such as cholera and typhoid. These illnesses are primarily spread through the fecal-oral route, occurring when water sources become contaminated with the waste of infected individuals. By ensuring water is purified and waste is properly managed, the transmission cycle of these pathogens is effectively broken.

113. (B) Incineration - Burning of solid waste at high temperatures
Incineration is a waste disposal method that involves the controlled burning of solid waste at very high temperatures, significantly reducing its volume and destroying many hazardous components. Composting is for organic waste, and landfills involve burying waste rather than biogas production. Recycling involves processing

the characteristic fluid accumulation or physical edema.

97. (B) Hidden Hunger
Hidden hunger is a form of malnutrition that occurs when individuals consume enough calories but lack essential micronutrients such as vitamins and minerals. Unlike protein-energy malnutrition, it often has no visible warning signs, yet it can cause serious long-term health problems, including impaired cognitive development and increased disease susceptibility. This condition affects millions globally who rely on nutrient-poor, staple-based dietary sources.

98. (D) Vitamin B12 and Folic acid
Megaloblastic anemia is a blood disorder characterized by the presence of abnormally large, immature red blood cells. It is primarily caused by a deficiency in Vitamin B12 or folic acid, both of which are essential for DNA synthesis and proper red blood cell maturation. Deficiencies in these nutrients lead to ineffective erythropoiesis, resulting in a reduced number of functional oxygen-carrying cells in circulation.

99. (A) Edema is a hallmark feature of Kwashiorkor, whereas it is absent in Marasmus
A primary clinical distinction between Kwashiorkor and Marasmus is the presence of edema. Kwashiorkor is characterized by significant fluid accumulation in the tissues, leading to swelling of the belly and limbs, whereas Marasmus involves severe wasting of muscle and fat without edema. Both are forms of protein-energy malnutrition but represent different metabolic responses to severe dietary deprivation during the early childhood years.

100. (C) Undernutrition decreases the body's susceptibility to infectious diseases.
Malnutrition encompasses both undernutrition and overnutrition, including conditions like obesity and micronutrient deficiencies. It is factually incorrect to state that undernutrition decreases susceptibility to diseases; instead, it severely weakens the immune system, making individuals far more vulnerable to infectious illnesses. Anemia remains a major public health challenge, particularly among Indian women, reflecting significant widespread micronutrient malnutrition across the whole population.

101. (A) P-IV, Q-I, R-II, S-III
Pasteurization involves heating to kill pathogens followed by rapid cooling, while dehydration removes moisture to stop microbial growth. Salting uses osmosis to draw out water, making the environment inhospitable for bacteria. Freezing slows down enzyme activity and microbial reproduction at low temperatures. These diverse methods are essential for extending the shelf life of food and ensuring it remains safe for human consumption.

102. (A) Both A and R are true and R is the correct explanation of A
Regular tooth brushing is essential for maintaining dental hygiene and preventing decay. Bacteria present in the oral cavity interact with sugars from food residues to produce acidic byproducts. These acids gradually dissolve the mineralized tooth enamel, leading to the formation of cavities or dental caries. Brushing removes the plaque and food particles that fuel this acid production, thereby protecting the structural integrity of teeth.

103. (B) Chicory - Black pepper
Chicory is commonly used as an adulterant in coffee powder rather than black pepper. Black pepper is more frequently adulterated with dried papaya seeds, which have a similar appearance. Metanil yellow is often added to turmeric for color, argemone oil to mustard oil, and urea to milk to increase nitrogen content. Therefore, the pairing of chicory with black pepper is the incorrect match.

104. (A) I, II, III and IV
The Food Safety and Standards Authority of India is the central regulatory body for food safety, operating under the Ministry of Health & Family Welfare. It enforces the 2006 Act, licenses food businesses, and promotes public health. However, it does not regulate pharmaceutical drugs; that is the responsibility of the Central Drugs Standard Control Organization. Thus, only the first four statements accurately describe FSSAI's role.

105. (B) II, I, III, IV
Effective handwashing begins with wetting the hands and applying soap. The process involves rubbing the palms together with interlaced

Click Here to Buy book on Amazon

rigidity and strength to bones and teeth. Iron is the central component of hemoglobin, not iodine, which is needed for thyroxine synthesis. Zinc is important for immunity and enzymatic reactions rather than nerve transmission, which primarily involves sodium and potassium. Thus, the statement regarding the structural role of calcium and phosphorus is factually correct.

89. (D) It is essential for blood clotting and muscle contraction
Beyond its well-known role in bone structure, calcium ions are essential for several critical cellular and physiological processes. They are a vital factor in the complex cascade of blood clotting and are required to trigger muscle contraction in both skeletal and cardiac tissues. Furthermore, calcium serves as an important secondary messenger in cellular signaling pathways, highlighting its multi-functional importance in maintaining systemic human health.

90. (A) Maintaining the balance of water and dissolved salts in body fluids
Osmoregulation is the active biological process of maintaining the precise balance of water and dissolved solutes, such as salts and ions, within the body's fluids. This mechanism ensures that the osmotic pressure of blood and other tissues remains stable, which is essential for proper cellular function and preventing cells from swelling or shrinking. It is primarily regulated by the kidneys and the nervous system.

91. (A) P-IV, Q-III, R-II, S-I
Kwashiorkor is characterized by edema or swelling of the belly, while Marasmus involves extreme wasting of muscles and fat. Rickets leads to soft bones and bow legs due to Vitamin D deficiency, and goiter manifests as a swelling in the neck from iodine deficiency. These diseases highlight the severe physical consequences of lacking specific macronutrients or micronutrients during critical stages of development.

92. (A) Both A and R are true and R is the correct explanation of A
The Mid-Day Meal Scheme is a significant intervention that has successfully increased school enrollment and improved the nutritional status of children across India. By providing a guaranteed, nutrient-dense meal daily, it directly addresses child hunger and protein-energy malnutrition. The scheme also serves as an incentive for parents in disadvantaged communities to send their children to school, thereby supporting both health and education.

NODIA

93. (A) Vitamin D deficiency - Night blindness
Vitamin D deficiency is primarily associated with rickets in children and osteomalacia in adults, affecting bone mineralization. Night blindness is actually caused by a deficiency of Vitamin A, which is essential for the production of visual pigments in the retina. The other pairs, including protein with Kwashiorkor, Vitamin C with scurvy, and iron with anemia, are correctly matched according to fundamental nutritional science.

94. (B) I, II, III and IV
Protein Energy Malnutrition includes Kwashiorkor, which is a protein deficiency affecting older children, and Marasmus, which is a total calorie and protein deficiency affecting infants. Kwashiorkor is characterized by edema and a pot-belly, while Marasmus is marked by severe wasting and a 'skin and bones' appearance. Statement five is incorrect because a pot-belly is a symptom of Kwashiorkor, not the wasting in Marasmus.

95. (A) III, I, II, IV
The history of nutritional interventions in Tamil Nadu began with the Justice Party providing meals in Chennai schools during the 1920s. This was followed by K. Kamaraj's statewide Mid-Day Meal Scheme in the 1950s and the expansion by M.G. Ramachandran in the 1980s. The Moovalur Ramamirtham Ammaiyar Pudhumai Penn Scheme is a recent initiative, making the chronological sequence III, I, II, and IV.

96. (C) Extreme muscle wasting resulting in a 'skin and bones' physical appearance
Kwashiorkor is clinically characterized by edema, an enlarged liver, and stunted growth, often giving children a deceptively plump appearance. Extreme muscle wasting and a 'skin and bones' appearance are instead the defining features of Marasmus, which results from a severe deficiency of all calories. While Kwashiorkor involves some muscle loss, it is often masked by

materials into new products. Thus, the description of incineration is the only correctly matched pair in the options.

114. (A) I, II and III
Oral Rehydration Solution is a life-saving treatment for dehydration that combines safe water, salts, and sugar to utilize the sodium-glucose co-transport mechanism in the intestine. It is administered orally rather than intravenously. While it treats the symptoms of dehydration, it does not cure the underlying infection causing diarrhea. Therefore, only the first three statements accurately describe the nature and function of ORS.

115. (A) IV, II, I, III
Municipal water treatment begins with coagulation and flocculation to clump fine particles together, followed by sedimentation where these clumps settle. The water then undergoes filtration through sand or gravel to remove remaining suspended matter. The final step is disinfection, typically via chlorination, to kill any lingering pathogens before distribution. This comprehensive process ensures that water from natural sources is made safe.

116. (C) Water that is safe for human consumption and free from harmful impurities
Potable water is defined as water that has been treated or purified to meet safety standards, making it suitable for drinking and food preparation without risk of health problems. It must be free from harmful bacteria, viruses, parasites, and toxic chemical impurities. Ensuring access to potable water is a fundamental goal of public health and infrastructure development worldwide to prevent widespread mortality.

117. (B) 2014
The Swachh Bharat Mission was officially launched by the Government of India on October 2, 2014, coinciding with the birth anniversary of Mahatma Gandhi. This massive national campaign aimed to achieve universal sanitation coverage and eliminate open defecation across both rural and urban areas. It focused on the construction of millions of toilets and promoting sustainable waste management practices to improve quality.

118. (D) It transforms organic, biodegradable waste into nutrient-rich manure
Composting is a natural biological process that involves the aerobic decomposition of organic, biodegradable waste—such as food scraps and garden trimmings—by microorganisms. This method transforms waste into nutrient-rich humus or manure, which can be used to improve soil fertility in agriculture and gardening. It is an environmentally friendly waste disposal strategy that reduces the volume of material sent to landfills today.

119. (B) Removal of dissolved inorganic solids and heavy metals such as arsenic and fluoride
A defining feature of Reverse Osmosis is its ability to effectively remove a wide range of dissolved inorganic solids, including heavy metals like arsenic, lead, and fluoride, as well as excess salts. It works by forcing water through a semi-permeable membrane at high pressure, which traps these contaminants while allowing pure water to pass. This technology is essential for treating highly polluted sources.

120. (C) Utilization of the sodium-glucose co-transport mechanism in the small intestine during illness
The effectiveness of Oral Rehydration Solution relies on the physiological sodium-glucose co-transport mechanism in the small intestine. In this process, the presence of glucose significantly enhances the absorption of sodium and water across the intestinal lining, even during episodes of diarrhea. This discovery revolutionized the treatment of dehydration, providing a simple and highly effective oral therapy that has saved millions globally.

NODIA

121. (A) P-III, Q-IV, R-II, S-I
Anthracosis or black lung disease is caused by inhaling coal dust, while silicosis results from exposure to silica dust in mining or construction. Asbestosis is a chronic lung condition caused by asbestos fibers, and byssinosis is a respiratory disease linked to cotton dust exposure in textile industries. These conditions are classified as occupational pneumoconioses, highlighting the respiratory risks associated with specific environments.

I. Amoebic dysentery
II. Ringworm
III. Sleeping sickness
IV. Kala-azar
(A) P-IV, Q-I, R-III, S-II
(B) P-III, Q-IV, R-I, S-II
(C) P-I, Q-II, R-IV, S-III
(D) P-IV, Q-III, R-I, S-II
(E) Answer not known

24. Which of the following vaccines is given at birth under the National Immunisation Schedule in India?
(A) Measles-Rubella (MR)
(B) Bacillus Calmette-Guérin (BCG)
(C) DPT booster
(D) Tetanus toxoid (TT)
(E) Answer not known

25. Consider the following statements about Dengue:
I. It is caused by a flavivirus.
II. The vector is primarily the Aedes aegypti mosquito.
III. A defining symptom is severe pain in the bones and joints.
IV. It is treated using targeted antiviral antibiotics.
Which of the above statements are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II, III and IV only
(D) I and III only
(E) Answer not known

26. Which of the following is a classic example of an emerging infectious disease?
(A) Plague
(B) Tuberculosis
(C) Polio
(D) COVID-19
(E) Answer not known

27. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): Fungal infections like candidiasis often occur in immunocompromised patients.
Reason (R): A healthy immune system keeps opportunistic fungal pathogens in check.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

28. Identify the correct statement regarding the Nikshay Poshan Yojana.
(A) It provides financial support for HIV patients in India.
(B) It offers monthly nutritional support to notified TB patients.
(C) It is a vaccination drive for eradicating polio.
(D) It supplies free mosquito nets for malaria prevention.
(E) Answer not known

29. Which of the following pairs of disease and its pathogen type is correctly matched?
(A) Ringworm - Helminth
(B) Malaria - Protozoa
(C) Typhoid - Virus
(D) Chikungunya - Bacteria
(E) Answer not known

30. Identify the incorrect statement regarding COVID-19.
(A) The virus multiplies using the host's red blood cells.
(B) It is caused by the SARS-CoV-2 virus.
(C) It is primarily transmitted through respiratory droplets.
(D) Vaccination programmes in India included Covishield and Covaxin.
(E) Answer not known

31. Select the correct sequence of the HIV lifecycle in a host cell.
(A) Binding → Reverse transcription → Integration → Replication → Budding
(B) Binding → Integration → Reverse transcription → Budding → Replication
(C) Reverse transcription → Binding → Replication → Integration → Budding
(D) Integration → Binding → Reverse transcription → Replication → Budding
(E) Answer not known

Downloaded from www.pdf.tube

130. (D) Workers should be encouraged to take meals inside the dusty work areas to save time
Effective dust control measures include wet drilling to suppress particles, using high-quality industrial respirators, and employing vacuum cleaning rather than dry sweeping. It is fundamentally unsafe and incorrect to encourage workers to take meals inside dusty work areas; this practice significantly increases the risk of ingesting harmful particles. Proper hygiene requires designated clean areas for eating to minimize health risks.

131. (A) P-II, Q-IV, R-I, S-III
Alcohol consumption impairs liver function and coordination, while nicotine in tobacco stimulates adrenaline release and raises heart rate. Opiates like heroin depress the central nervous system and induce sleep, and cannabis alters perception and memory. These substances interfere with normal brain chemistry and physiological processes, leading to significant health complications and the potential for development of substance use disorders.

132. (A) Both A and R are true and R is the correct explanation of A
Chronic stress triggers a prolonged physiological response involving the continuous secretion of hormones like cortisol and adrenaline. While these hormones are beneficial in short-term emergencies, their sustained presence can disrupt immune function, elevate blood pressure, and cause digestive issues. This biochemical imbalance explains how psychological stress directly manifests as physical disease, highlighting the critical importance of management for overall health.

133. (A) Schizophrenia - Split personality where a person manifests two distinct identities
Schizophrenia is a chronic mental disorder characterized by distortions in thinking, perception, and emotions, such as hallucinations or delusions, but it is not the same as having a split personality. The latter is actually a feature of dissociative identity disorder. Depression, anxiety, and PTSD are correctly described by their primary symptoms of persistent sadness, excessive worry, and trauma-related clinical flashbacks.

134. (A) I, II, IV and V
Chronic alcoholism leads to severe health issues including liver cirrhosis, nervous system impairment, heart muscle weakness, and dangerous withdrawal symptoms like delirium tremens. It actually hinders the absorption of essential vitamins and minerals rather than increasing it. Therefore, only the statements concerning liver disease, neurological impact, cardiomyopathy, and withdrawal are correct descriptions of the systemic damage caused by long-term consumption.

135. (A) II, IV, I, III
The development of substance addiction typically follows a progression starting with initial experimentation or use. Over time, the body may develop tolerance, requiring larger amounts to achieve the same effect. This leads to physiological and psychological dependence, where the individual needs the substance to feel normal. The final stage is addiction, characterized by compulsive use despite experiencing significant negative consequences.

136. (C) Alcohol
Alcohol is classified as a central nervous system depressant because it slows down brain activity by enhancing the effects of the inhibitory neurotransmitter GABA. This results in impaired judgment, delayed reaction times, and reduced coordination. In contrast, cocaine, caffeine, and amphetamines are stimulants that increase nervous system activity. Understanding these classifications is vital for recognizing the physiological impacts of different substances.

137. (D) Depending solely on willpower and ignoring the symptoms
Clinical depression is a serious medical condition that requires professional intervention through therapy, counseling, or medication prescribed by a psychiatrist. Depending solely on willpower and ignoring symptoms is the least effective and potentially most harmful strategy, as it often leads to worsening of the condition. Effective management integrates medical care, physical activity, and social support to help individuals recover.

NODIA

Assertion (A): Vector-borne diseases like malaria are most prevalent in tropical and subtropical regions.
Reason (R): The warm and humid climate in these regions supports the survival and rapid breeding of mosquito vectors.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

8. Identify the correct statement regarding cholera.
(A) It is primarily an airborne viral disease.
(B) It leads to severe acute watery diarrhoea.
(C) It is caused by an intestinal parasite.
(D) The infection is typically spread via tick bites.
(E) Answer not known

9. Which of the following pairs of disease and its mode of transmission is correctly matched?
(A) Measles - Vector-borne
(B) Tetanus - Droplet infection
(C) Hepatitis A - Waterborne
(D) Ringworm - Airborne
(E) Answer not known

10. Identify the incorrect statement regarding helminthic diseases.
(A) Ascariasis is caused by a roundworm.
(B) Filariasis affects the lymphatic system.
(C) Poor sanitation contributes to the spread of helminths.
(D) Tapeworm infections are transmitted via mosquito bites.
(E) Answer not known

11. Select the correct sequence of the chain of infection.
(A) Infectious agent → Reservoir → Portal of exit → Mode of transmission → Portal of entry → Susceptible host
(B) Reservoir → Infectious agent → Mode of transmission → Portal of exit → Portal of entry → Susceptible host
(C) Infectious agent → Susceptible host → Reservoir → Mode of transmission → Portal of exit → Portal of entry
(D) Susceptible host → Portal of entry → Mode of transmission → Portal of exit → Reservoir → Infectious agent
(E) Answer not known

12. Which of the following is NOT classified as an airborne disease?
(A) Tuberculosis
(B) Cholera
(C) Measles
(D) Chickenpox
(E) Answer not known

13. Arrange the typical stages of rabies infection in a human in the correct sequence.
I. Encephalitis phase
II. Incubation period
III. Prodromal phase
IV. Coma and death
(A) II, I, III, IV
(B) II, III, I, IV
(C) III, II, I, IV
(D) I, III, II, IV
(E) Answer not known

14. Which is the most appropriate primary prevention strategy for waterborne diseases in rural Tamil Nadu?
(A) Providing safely managed drinking water and improved sanitation infrastructure.
(B) Implementing large-scale vaccination programs for all resident adults.
(C) Conducting widespread distribution of oral rehydration salt packets.
(D) Executing vector control measures using extensive insecticide spraying.
(E) Answer not known

15. Consider the following statements about HIV and AIDS:
I. HIV attacks the body's immune system, specifically CD4 cells.
II. HIV can be transmitted through breast milk.
III. Antiretroviral therapy (ART) can cure HIV completely.
IV. AIDS is the most advanced stage of HIV infection.
V. The National AIDS Control Programme is implemented in India to combat HIV.
Which of the above statements are correct?
(A) I, II, IV and V only

Click Here to Buy book on Amazon

147. (B) 60 - 100 beats per minute
For a healthy adult at rest, the normal heart rate, also known as the pulse rate, typically ranges from sixty to one hundred beats per minute. This rate can be influenced by various factors including fitness level, age, emotional state, and certain medications. Athletes may have lower resting heart rates, while stress or physical exertion will naturally cause the rate to increase.

148. (C) Consists of two hemispheres connected by a nerve fiber tract called the corpus callosum
The cerebrum is the largest part of the human brain and consists of two cerebral hemispheres that are joined by a thick band of nerve fibers called the corpus callosum. This structure allows for the integration and communication of information between the two sides. The outer surface, or cortex, is composed of grey matter and is highly folded to increase area.

149. (A) Biconcave shape lacking a nucleus to maximize space for haemoglobin
Mature human erythrocytes are uniquely designed for their role in gas transport, featuring a biconcave shape that increases surface area for diffusion. Crucially, they lack a nucleus and most other organelles, which maximizes the internal space available for housing hemoglobin molecules. This specialized structure allows red blood cells to carry oxygen efficiently while remaining flexible enough to pass through narrow capillaries.

150. (D) Failure of the thyroid gland to produce thyroxine despite high stimulation
The clinical scenario of a goiter with low thyroxine and high TSH levels indicates that the pituitary gland is correctly attempting to stimulate the thyroid, but the thyroid gland itself is unable to produce sufficient hormones. This is often due to iodine deficiency. The high TSH levels reflect the body's compensatory mechanism attempting to overcome the failure of the thyroid gland.

151. (A) P-III, Q-IV, R-I, S-II
Vitamin B1 is thiamine, essential for carbohydrate metabolism, and B2 is riboflavin, which is involved in energy production. Vitamin B3 is niacin, important for cellular signaling and DNA repair, while B12 is cyanocobalamin, which is vital for nerve function and red blood cell formation. These water-soluble vitamins are grouped together as the B-complex due to their interrelated metabolic roles.

152. (A) Both A and R are true and R is the correct explanation of A
Iron deficiency anemia is widespread among Indian adolescent girls and pregnant women due to high physiological requirements during these life stages. Rapid growth in adolescence and the needs of the developing fetus significantly increase iron demand. If the regular diet does not provide sufficient iron-rich foods, the body's stores become depleted, leading to decreased hemoglobin levels and nutritional anemia symptoms.

NODIA

153. (D) Innuyir Kappom-Nammai Kaakkum 48 - Free road accident treatment for the first 48 hours
The Innuyir Kappom-Nammai Kaakkum 48 scheme in Tamil Nadu is specifically designed to provide free emergency medical treatment to road accident victims during the critical first forty-eight hours after an incident. This program aims to reduce mortality and morbidity by ensuring immediate care regardless of the victim's socio-economic status. Other programs mentioned serve different community health purposes.

154. (A) I, II, III and V
The Swachh Bharat Mission is a comprehensive initiative aimed at achieving an open-defecation-free status through toilet construction and waste management. It also focuses on behavioral change toward healthy sanitation. The mission is not limited to urban areas; it has two distinct components for both rural and urban regions. Therefore, all statements except the one claiming it ignores rural areas are correct.

155. (A) III, II, IV, I
Fat digestion begins with the emulsification of large globules by bile salts in the small intestine. Pancreatic lipase then breaks these smaller droplets into fatty acids and glycerol. Within the intestinal cells, these components are reassembled into chylomicrons. Finally, these chylomicrons are absorbed into the lacteals of the lymphatic system, which transport the lipids into the systemic bloodstream.

122. (A) Both A and R are true and R is the correct explanation of A
Prolonged exposure to high-intensity noise in industrial settings often leads to permanent sensorineural hearing loss. This occurs because loud sound waves cause excessive vibration that eventually damages or destroys the delicate hair cells within the cochlea of the inner ear. Since these specialized sensory cells do not regenerate in humans, the resulting hearing impairment is irreversible, emphasizing the need for ear protection.

123. (B) Matchstick and firework manufacturing involving chemical and fire hazards
The matchstick and firework industry is correctly associated with significant chemical and fire hazards due to the handling of flammable substances like phosphorus and sulfur. Lead poisoning is more typical of paint or battery manufacturing, while silicosis affects miners rather than IT professionals. Textile workers are at risk for respiratory issues like byssinosis, making option B the only correctly matched hazard.

124. (A) I, II, III and IV
Prevention of occupational hazards involves a multi-pronged approach: providing personal protective equipment, ensuring adequate ventilation, conducting regular medical screenings, and implementing ergonomic designs. However, increasing working hours is never a preventive measure; instead, it typically increases the duration of exposure and the risk of injury. Therefore, only the first four statements are recognized as effective strategies for maintaining health.

125. (A) II, IV, I, III
The traditional sequence of the first four limbs of Patanjali's Ashtanga Yoga begins with Yama, which represents ethical restraints and moral codes. This is followed by Niyama, or personal observances and self-discipline. Asana involves the practice of physical postures for stability and comfort, and Pranayama focuses on the regulation and control of breath. This progressive path prepares the body for meditation.

126. (C) Enhanced visual acuity
Chronic noise pollution is a significant environmental stressor linked to numerous adverse health outcomes, including hypertension, cardiovascular disease, sleep disturbances, and increased anxiety. There is no scientific evidence suggesting that loud noise enhances visual acuity; in fact, high stress levels can sometimes negatively impact overall sensory perception. Protecting the ears from excessive noise is therefore essential for hearing and systemic well-being.

127. (D) A nationwide campaign encouraging the inclusion of physical activity and sports in daily life
The Fit India Movement is a comprehensive nationwide campaign launched by the Government of India to encourage citizens to incorporate physical activity and sports into their daily lives. Its goal is to combat sedentary lifestyles and the rising prevalence of lifestyle diseases by promoting simple, accessible fitness practices. Unlike specialized sports recruitment, it focuses on making fitness a natural part of every routine.

128. (C) Biological hazards
Exposure to infectious agents such as bacteria, viruses, fungi, or parasites in workplace settings is classified as a biological hazard. This is a significant risk for healthcare professionals, laboratory technicians, and agricultural workers who may come into contact with pathogens. Unlike physical or chemical hazards, biological hazards involve living organisms that can reproduce and cause diseases like hepatitis or various fungal infections.

129. (B) Aerobic exercises use oxygen for energy and endurance, while anaerobic exercises involve high-intensity bursts
Aerobic exercises, such as jogging or swimming, use oxygen to generate energy for sustained, moderate-intensity activity over time. In contrast, anaerobic exercises, such as sprinting or heavy weightlifting, involve short, high-intensity bursts where the body's demand for oxygen exceeds the available supply. This distinction is based on the metabolic pathways used to produce ATP, with each exercise offering unique health benefits.

Downloaded from www.pdf.tube

CHAPTER 10

Human Diseases: Communicable and Non-Communicable

1. Consider the following statements regarding bacterial diseases:
I. Tuberculosis is caused by Mycobacterium tuberculosis.
II. Typhoid fever is transmitted primarily through droplet infection.
III. Cholera is caused by Vibrio cholerae.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) II only
(E) Answer not known

2. Which of the following best defines a non-communicable disease?
(A) A disease typically transmitted from animals to humans through a biological vector.
(B) A condition not caused by pathogens and not transmissible between individuals.
(C) A condition caused by pathogenic microorganisms spreading through contaminated water sources.
(D) An infectious condition that remains asymptomatic for long durations before transmission occurs.
(E) Answer not known

3. Match the items in List I with those in List II and select the correct option:
List I: (Pathogens)
P. Plasmodium vivax
Q. Candida albicans
R. Wuchereria bancrofti
S. Salmonella typhi
List II: (Categories)
I. Fungi
II. Bacteria
III. Protozoa
IV. Helminth
(A) P-III, Q-I, R-IV, S-II
(B) P-IV, Q-II, R-I, S-III
(C) P-III, Q-II, R-IV, S-I
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

NODIA

4. Which of the following pathogens is responsible for causing syphilis?
(A) Treponema pallidum
(B) Neisseria gonorrhoeae
(C) Haemophilus ducreyi
(D) Chlamydia trachomatis
(E) Answer not known

5. Consider the following statements regarding viral diseases:
I. Dengue is transmitted by the bite of infected Aedes mosquitoes.
II. Hepatitis B is primarily transmitted through contaminated water and food.
III. Rabies is a viral disease usually transmitted through animal bites.
IV. Influenza is typically spread through airborne droplets.
Which of the above statements are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I and IV only
(E) Answer not known

6. Leprosy is primarily a chronic infectious disease caused by which of the following pathogens?
(A) Mycobacterium leprae
(B) Clostridium tetani
(C) Corynebacterium diphtheriae
(D) Yersinia pestis
(E) Answer not known

7. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:

156. (B) Deficiencies, excesses, or imbalances in an individual's intake of energy and nutrients
According to the World Health Organization, malnutrition is defined broadly as any deficiency, excess, or imbalance in a person's intake of energy and nutrients. This comprehensive definition covers three groups of conditions: undernutrition (stunting and wasting), micronutrient-related malnutrition, and overweight or obesity. It acknowledges that both the lack of food and consumption of nutrient-poor foods contribute to malnutrition.

157. (B) 2011
Although the Food Safety and Standards Act was passed in 2006, the Food Safety and Standards Authority of India (FSSAI) became fully operational to enforce the unified standards and regulations in 2011. This transition marked the point where older, fragmented food laws were officially superseded by a single regulatory body tasked with ensuring the safety of food in India.

158. (C) Plump appearance due to edema masking underlying severe muscle wasting in children
Kwashiorkor is a form of severe protein malnutrition often seen in children, characterized by a deceptively plump appearance. This physical state is caused by edema, or fluid accumulation, which leads to swelling of the belly, face, and limbs. This swelling masks the underlying loss of muscle mass. Unlike Marasmus, Kwashiorkor occurs when the diet is specifically lacking in high-quality proteins.

159. (D) Leaves a residual disinfectant that prevents re-contamination during distribution
A significant technical advantage of using chlorination in water treatment is that it provides a residual disinfectant effect. A small amount of chlorine remains in the water as it travels through the distribution system, continuing to kill any pathogens that might enter through leaks or old pipes. This secondary protection is vital for maintaining water safety all the way to the tap.

160. (C) Weight in kilograms divided by height in meters squared
Body Mass Index is a standard screening tool used to categorize individuals into weight groups based on their height and weight. It is calculated by dividing a person's weight in kilograms by the square of their height in meters. The resulting value is compared against established ranges to identify if a person is underweight, normal weight, overweight, or obese.

www.nodia.in

Click Here to Buy book on Amazon

(B) I, III, IV and V only
(C) II, III and V only
(D) I, II and IV only
(E) Answer not known

16. During a monsoon outbreak in Chennai, hospitals report sudden spikes in patients with high fever, severe joint pain, and rash. Which disease is most likely circulating?
(A) Typhoid
(B) Tuberculosis
(C) Cholera
(D) Chikungunya
(E) Answer not known

17. Match the items in List I with those in List II and select the correct option:
List I: (Vector)
P. Anopheles mosquito
Q. Culex mosquito
R. Sandfly
S. Tsetse fly
List II: (Disease)
I. Sleeping sickness
II. Kala-azar
III. Filariasis
IV. Malaria
(A) P-IV, Q-III, R-II, S-I
(B) P-III, Q-IV, R-I, S-II
(C) P-IV, Q-I, R-III, S-II
(D) P-II, Q-III, R-IV, S-I
(E) Answer not known

18. Based on classification, which of the following falls under zoonotic diseases?
(A) Polio
(B) Nipah virus infection
(C) Scurvy
(D) Sickle cell anaemia
(E) Answer not known

19. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): The DOTS programme is central to controlling Tuberculosis in India.
Reason (R): DOTS ensures that patients strictly adhere to their treatment regimen, preventing multidrug-resistant TB.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

20. Which of the following pairs regarding Hepatitis is incorrectly matched?
(A) Hepatitis C - Currently preventable by a vaccine
(B) Hepatitis A - Faecal-oral route
(C) Hepatitis B - Bloodborne transmission
(D) Hepatitis E - Contaminated water
(E) Answer not known

21. Consider the following statements regarding Malaria:
I. The causative agent is a protozoan parasite of the genus Plasmodium.
II. The parasite multiplies first in the human red blood cells, then in the liver.
III. Symptoms include cyclic fever, chills, and sweating.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) III only
(E) Answer not known

22. What defines the term 'Antimicrobial Resistance' (AMR)?
(A) Microorganisms surviving and growing despite medications intended to kill them.
(B) A condition where the host's immune system naturally rejects antibiotic therapy.
(C) A specific viral mutation that significantly increases the transmission rate.
(D) The inability of a vaccine to stimulate the production of antibodies.
(E) Answer not known

23. Match the items in List I with those in List II and select the correct option:
List I: (Causative Agent)
P. Leishmania donovani
Q. Entamoeba histolytica
R. Trypanosoma brucei
S. Trichophyton
List II: (Disease)

Downloaded from www.pdf.tube

138. (A) It poses significant health risks, including lung cancer and respiratory infections, to non-smokers exposed to it
Second-hand smoke, or environmental tobacco smoke, contains the same toxic and carcinogenic chemicals that active smokers inhale. Scientific studies have conclusively shown that exposure to this smoke poses significant health risks to non-smokers, including an increased likelihood of developing lung cancer, heart disease, and respiratory infections. Children are particularly vulnerable, facing higher risks of asthma from passive smoking exposure.

139. (B) Possible lack of trained professionals leading to superficial or incorrect guidance
While mental health awareness programs are vital for reducing stigma, a major challenge is the potential shortage of adequately trained professionals to provide guidance. Superficial or incorrect information can sometimes do more harm than good. Furthermore, these programs are designed to promote understanding and early intervention rather than serving as a permanent cure for serious illnesses in one session.

140. (B) Nicotine
Nicotine is the primary alkaloid found in tobacco plants and is the chemical responsible for the highly addictive nature of tobacco products. It rapidly enters the bloodstream and reaches the brain, where it stimulates the release of dopamine, creating a temporary feeling of pleasure and alertness. This biochemical reward system leads to physical dependence and makes quitting extremely challenging.

141. (A) P-II, Q-I, R-IV, S-III
Salivary amylase is produced by the salivary glands, while pepsin is secreted by the gastric glands in the stomach. Bile salts are synthesized by the liver and stored in the gallbladder, and trypsin is produced by the pancreas. Each of these secretions plays a specialized role in the chemical breakdown of specific food components within the human digestive system.

142. (A) Both A and R are true and R is the correct explanation of A
Vital capacity is a critical diagnostic measure that assesses the maximum volume of air an individual can forcefully exhale after taking a deepest possible breath. It reflects the overall functional capacity of the lungs and the strength of the respiratory muscles. A reduction in vital capacity can indicate underlying respiratory issues such as obstructive or restrictive lung diseases.

143. (D) Frontal lobe - Responsible for reasoning, planning, and voluntary movement
The frontal lobe is the brain's center for higher-order functions including reasoning, planning, decision-making, and the control of voluntary motor movements. The occipital lobe is dedicated to vision, while the temporal lobe processes auditory information and the parietal lobe handles somatosensory input like touch and pressure. Therefore, the description of the frontal lobe's function is correctly matched among options.

144. (A) I, II, III and IV
Kidneys maintain blood pH, produce erythropoietin for red blood cell synthesis, and use the Loop of Henle to concentrate urine. Dialysis is used as an essential treatment for renal failure. However, under normal physiological conditions, kidneys do not filter out essential plasma proteins; their presence in urine usually indicates kidney damage. Thus, only the first four statements are accurate.

145. (A) II, IV, I, III
The electrical conduction of the heart begins at the SA node, the natural pacemaker. The impulse then travels to the AV node, which provides a brief delay for atrial emptying. From there, it moves through the Bundle of His and finally spreads through the Purkinje fibers to trigger the synchronized contraction of the ventricles. This coordinated electrical pathway is essential.

146. (D) The volume of air that remains in the lungs even after a forceful expiration
Residual volume is defined as the specific amount of air that remains in the lungs even after the most forceful possible expiration. This volume cannot be voluntarily exhaled and is essential for preventing the total collapse of the alveoli. It also ensures that gas exchange can continue between breaths, maintaining a steady level of oxygen during the respiratory cycle.

NODIA

32. Which of the following is NOT an objective of the National AIDS Control Programme (NACP) in India?
(A) Providing free anti-retroviral therapy to all patients across the country.
(B) Implementing awareness campaigns to promote safe practices among citizens.
(C) Focusing on the prevention of parent-to-child transmission of the virus.
(D) Total eradication of the HIV virus from the population by 2025.
(E) Answer not known

33. Arrange the stages of Plasmodium life cycle sequentially starting from human infection.
I. Sporozoites injected into human blood
II. Gametocytes taken up by mosquito
III. Merozoites released from red blood cells
IV. Multiplication in liver cells
(A) I, IV, III, II
(B) I, III, IV, II
(C) IV, I, III, II
(D) I, IV, II, III
(E) Answer not known

34. What is the most appropriate action for managing a sudden outbreak of waterborne disease in a community?
(A) Administering broad-spectrum antibiotics to every member of the community.
(B) Issuing boil-water advisories and conducting thorough water quality testing.
(C) Enforcing strict isolation of the community from all neighboring villages.
(D) Conducting a comprehensive vaccination drive specifically against dengue.
(E) Answer not known

35. Consider the following statements about Vaccines and Immunity:
I. Vaccines stimulate the body to produce antibodies.
II. Live attenuated vaccines contain a weakened form of the pathogen.
III. Inactivated vaccines often require booster doses.
IV. Herd immunity protects individuals who cannot be vaccinated.
V. Toxoid vaccines use a toxin made by the germ that causes a disease.
Which of the above statements are correct?
(A) I, II, III and IV only
(B) I, II, III, IV and V
(C) I, III, IV and V only
(D) II, III and V only
(E) Answer not known

36. If a public health worker is studying diseases transmitted from animals to humans, which concept are they applying?
(A) Zoonosis
(B) Autoimmunity
(C) Antimicrobial resistance
(D) Congenital transmission
(E) Answer not known

37. Match the items in List I with those in List II and select the correct option:
List I: (Disease)
P. Tuberculosis
Q. HIV/AIDS
R. Cholera
S. Dengue
List II: (Mode of Transmission)
I. Waterborne
II. Droplet
III. Vector-borne
IV. Body fluids
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-III, S-I
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

38. Which of the following is an example of a re-emerging infectious disease in the global context?
(A) Measles (in populations with dropping vaccine coverage)
(B) Eradicated smallpox
(C) Type-2 Diabetes
(D) Cardiovascular disease
(E) Answer not known

39. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): Overprescription and incomplete courses of antibiotics contribute significantly to antimicrobial resistance (AMR).
Reason (R): Bacteria that survive exposure to

Click Here to Buy book on Amazon

Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) II only
(E) Answer not known

102. When comparing Type 1 and Type 2 diabetes mellitus, which feature is unique to Type 1?
(A) Absolute insulin deficiency resulting from autoimmune destruction.
(B) Management primarily involving changes to diet and exercise.
(C) Presentation that commonly occurs during late adulthood stages.
(D) Condition characterized by the development of insulin resistance.
(E) Answer not known

103. Match the items in List I with those in List II and select the correct option:
List I: (Global/National Entity)
P. WHO
Q. ICMR
R. IDSP
S. NHM
List II: (Primary Role)
I. India's apex body for biomedical research
II. International public health agency
III. Comprehensive healthcare delivery scheme in India
IV. National disease surveillance network
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

104. Which of the following is a primary feature of chronic kidney disease (CKD)?
(A) Reversible decline in liver function occurring over days.
(B) Irreversible loss of renal function over months or years.
(C) Acute kidney stone formation causing sudden intense pain.
(D) Bacterial infection affecting the entire urinary tract.
(E) Answer not known

NODIA

105. Consider the following statements regarding HIV transmission:
I. It can be transmitted via unprotected sexual contact.
II. It spreads through sharing of contaminated needles.
III. It can be transmitted from an infected mother to child during childbirth.
IV. It is commonly spread through mosquito bites.
Which of the above statements are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I and IV only
(D) I, II and IV only
(E) Answer not known

106. Which of the following is a classic example of an autoimmune disease?
(A) Malaria
(B) Asbestosis
(C) Rabies
(D) Type 1 Diabetes
(E) Answer not known

107. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): Oral cancer has a high prevalence in certain Indian states.
Reason (R): The widespread habit of chewing tobacco and betel nut significantly increases the risk of oral malignancies.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

108. In the context of India's National Action Plan on Antimicrobial Resistance, which intervention is most relevant?
(A) Banning the use of all antibiotics completely in the country.
(B) Restricting over-the-counter sales and promoting rational use.
(C) Increasing the production of only first-generation antibiotics.

Assertion (A): High Body Mass Index (BMI) is a major risk factor for cardiovascular diseases.
Reason (R): Obesity can lead to high blood pressure, abnormal lipid profiles, and insulin resistance.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

48. Identify the correct statement regarding cancer.
(A) Benign tumors that spread very rapidly to distant parts of the body.
(B) Cancers that are entirely hereditary and impossible to prevent.
(C) Chemotherapy cycles used exclusively for treating bacterial infections.
(D) Uncontrolled division of abnormal cells occurring within the body.
(E) Answer not known

49. Which of the following pairs of cancer types and affected tissues is correctly matched?
(A) Leukemia - Bone and cartilage
(B) Sarcoma - Blood-forming tissue
(C) Carcinoma - Epithelial tissue
(D) Lymphoma - Nervous tissue
(E) Answer not known

50. Identify the incorrect statement regarding Chronic Obstructive Pulmonary Disease (COPD).
(A) Smoking is the leading cause of COPD.
(B) It is a curable disease if caught early.
(C) Symptoms include chronic cough and shortness of breath.
(D) It causes obstructed airflow from the lungs.
(E) Answer not known

51. Select the correct order of the typical diagnostic steps for cancer.
(A) Biopsy → Imaging → Physical Exam → Treatment Planning
(B) Physical Exam → Imaging → Biopsy → Treatment Planning
(C) Imaging → Physical Exam → Treatment Planning → Biopsy
(D) Biopsy → Physical Exam → Imaging → Treatment Planning
(E) Answer not known

52. Which of the following is NOT generally considered a modifiable risk factor for Non-Communicable Diseases?
(A) Age
(B) Physical inactivity
(C) Unhealthy diet
(D) Tobacco use
(E) Answer not known

53. Arrange the following BMI categories in sequential order from lowest to highest.
I. Overweight
II. Underweight
III. Obese
IV. Normal weight
(A) II, IV, I, III
(B) IV, II, I, III
(C) II, I, IV, III
(D) I, II, IV, III
(E) Answer not known

54. What is the most appropriate long-term management strategy for a patient with end-stage chronic kidney disease?
(A) Dialysis or kidney transplantation
(B) Dietary sodium increase
(C) Regular use of non-steroidal anti-inflammatory drugs (NSAIDs)
(D) Continuous antibiotic therapy
(E) Answer not known

55. Consider the following statements about Liver diseases:
I. Cirrhosis involves the replacement of healthy liver tissue with scar tissue.
II. Non-alcoholic fatty liver disease (NAFLD) is strongly linked to obesity and diabetes.
III. Hepatic failure can occur abruptly (acute) or over time (chronic).
IV. Alcohol abuse is a primary cause of liver cirrhosis.
V. The liver has no regenerative capacity.
Which of the above statements are correct?
(A) I, II, III and V only
(B) I, II, III and IV only
(C) II, III, IV and V only
(D) I, III and IV only
(E) Answer not known

Downloaded from www.pdf.tube

(B) II, III and IV only
(C) I, III and IV only
(D) I and II only
(E) Answer not known

86. Which diagnostic parameter is typically used to classify obesity?
(A) Body Mass Index (BMI)
(B) Blood pressure
(C) Fasting blood sugar
(D) Lipid profile
(E) Answer not known

87. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): The World Health Organization (WHO) plays a crucial role in managing pandemics like COVID-19.
Reason (R): State health departments have no authority or mechanisms to implement disease control measures locally.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

88. Identify the correct statement regarding sickle cell anaemia.
(A) An infectious disease primarily transmitted by mosquitoes.
(B) A genetic condition affecting the structure of hemoglobin.
(C) A condition resulting from chronic vitamin C deficiency.
(D) A disorder that primarily causes rapid bone deterioration.
(E) Answer not known

89. Which of the following pairs is incorrectly matched regarding vaccines?
(A) BCG - Tuberculosis
(B) OPV - Polio
(C) DPT - Dengue, Plague, Tetanus
(D) Hepatitis B vaccine - Liver infection
(E) Answer not known

90. Identify the incorrect statement about occupational diseases.
(A) Silicosis is common among mine and quarry workers.
(B) Asbestosis increases the risk of lung cancer.
(C) Occupational diseases can be largely prevented with appropriate safety gear (PPE).
(D) Byssinosis is caused by long-term exposure to loud noise.
(E) Answer not known

91. Select the correct order of the stages in a classic infectious disease course.
(A) Incubation → Prodromal → Illness → Decline → Convalescence
(B) Prodromal → Incubation → Illness → Convalescence → Decline
(C) Illness → Incubation → Prodromal → Decline → Convalescence
(D) Incubation → Illness → Prodromal → Convalescence → Decline
(E) Answer not known

92. Which of the following is NOT a complication associated with unmanaged diabetes mellitus?
(A) Neuropathy
(B) Chronic Obstructive Pulmonary Disease (COPD)
(C) Retinopathy
(D) Nephropathy
(E) Answer not known

93. Arrange the following components of the Ayushman Bharat scheme in terms of primary to tertiary care.
I. District Hospitals for advanced surgeries
II. Sub-centres upgraded to Health and Wellness Centres
III. Primary Health Centres providing initial maternal care
(A) II, III, I
(B) I, II, III
(C) III, II, I
(D) II, I, III
(E) Answer not known

94. What is the most appropriate step a state health department should take immediately upon detecting a cluster of unknown acute respiratory illness?

NODIA

III. Silica dust
IV. Asbestos fibers
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-I, R-IV, S-II
(D) P-I, Q-II, R-III, S-IV
(E) Answer not known

64. What is the characteristic feature of sickle cell anaemia?
(A) The chronic lack of essential blood clotting factors.
(B) The massive overproduction of white blood cells.
(C) The presence of an extra copy of chromosome 21.
(D) Red blood cells adopting a rigid and crescent-like shape.
(E) Answer not known

65. Consider the following statements about Down syndrome:
I. It is a congenital disorder.
II. It is caused by the presence of an extra copy of chromosome 21.
III. It results in intellectual disability and distinct facial features.
IV. It is preventable through diet modification during pregnancy.
Which of the above statements are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I and II only
(D) I, III and IV only
(E) Answer not known

66. Which of the following is a classic example of a lifestyle disease?
(A) Cholera
(B) Type 2 Diabetes
(C) Haemophilia
(D) Rabies
(E) Answer not known

67. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): Regular physical exercise and adequate sleep can significantly reduce the risk of cardiovascular diseases.
Reason (R): They help maintain normal blood pressure, manage weight, and reduce stress levels.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

68. Identify the correct statement regarding the National Health Mission (NHM).
(A) Providing accessible and high-quality healthcare services to all.
(B) Consisting exclusively of the National Rural Health Mission.
(C) Focusing solely on the construction of tertiary care hospitals.
(D) International programs that are funded entirely by the WHO.
(E) Answer not known

69. Which of the following correctly describes a feature of a national health scheme in India?
(A) Providing free insulin for all diabetic patients in the country.
(B) Implementing programs for increasing mental health awareness.
(C) Health insurance cover of ₹5 lakhs per family each year.
(D) Standard treatment protocols for cardiovascular emergencies.
(E) Answer not known

70. Identify the incorrect statement regarding the Ayushman Bharat scheme.
(A) The scheme is available only to citizens above 60 years of age.
(B) It has two components: Health and Wellness Centres and PM-JAY.
(C) PM-JAY focuses on secondary and tertiary care hospitalization.
(D) The scheme covers both public and empanelled private hospitals.
(E) Answer not known

71. Select the correct hierarchical sequence of disease surveillance systems in India from local to national levels under IDSP.
(A) Sub-center → Primary Health Center

Click Here to Buy book on Amazon

56. A 55-year-old male presents with facial drooping, arm weakness, and slurred speech. Which cardiovascular emergency is he likely experiencing?
(A) Heart attack
(B) Stroke
(C) Coronary artery disease
(D) Hypertension
(E) Answer not known

57. Match the items in List I with those in List II and select the correct option:
List I: (Disease)
P. Asthma
Q. Schizophrenia
R. Dental caries
S. Down syndrome
List II: (Category)
I. Genetic disease
II. Chronic respiratory disease
III. Mental disorder
IV. Oral health disease
(A) P-II, Q-III, R-IV, S-I
(B) P-III, Q-II, R-I, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

58. Based on classification, haemophilia belongs to which group of diseases?
(A) Zoonotic diseases
(B) Occupational diseases
(C) Lifestyle diseases
(D) Genetic diseases
(E) Answer not known

59. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): Lifestyle diseases are increasingly prevalent in urban Tamil Nadu.
Reason (R): Rapid urbanization has led to sedentary behavior, consumption of processed foods, and high stress levels.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

60. Which of the following pairs of mental disorders and their characteristics is incorrectly matched?
(A) Depression - Persistent feelings of sadness and a loss of interest in activities.
(B) Bipolar disorder - Constant state of lethargy without any identifiable mood swings.
(C) Schizophrenia - Experiences of hallucinations and strongly held false delusions.
(D) Anxiety disorders - Excessive worry and fear affecting daily cognitive functioning.
(E) Answer not known

61. Consider the following statements regarding the National Programme for Control of Blindness (NPCB):
I. It aims to reduce the prevalence of blindness to 0.3%.
II. Cataract surgery is a major component of this programme.
III. It completely ignores corneal blindness.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I only
(E) Answer not known

62. What defines periodontal disease?
(A) Inflammation affecting the tissues that surround and support the teeth.
(B) A viral infection specifically targeting the major salivary glands.
(C) A genetic condition leading to the premature loss of tooth enamel.
(D) A localized fungal infection appearing on the surface of the tongue.
(E) Answer not known

63. Match the items in List I with those in List II and select the correct option:
List I: (Occupational Disease)
P. Silicosis
Q. Asbestosis
R. Byssinosis
S. Anthracosis
List II: (Causative Dust)
I. Cotton dust
II. Coal dust

NODIA

78. Based on classification, which category does the Integrated Health Information Platform (IHIP) fall into?
(A) Disease surveillance and early warning electronic systems.
(B) Protocols specifically used for direct patient treatment.
(C) A manufacturing facility for the production of vaccines.
(D) Policy for preventing various types of occupational hazards.
(E) Answer not known

79. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): Byssinosis is common among workers in the cotton and textile industries.
Reason (R): Inhalation of cotton dust causes narrowing of the airways leading to respiratory distress.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

80. Which of the following pairs of congenital diseases and their traits is correctly matched?
(A) Haemophilia - Missing chromosome
(B) Sickle cell anaemia - Iron deficiency
(C) Color blindness - Extra Y chromosome
(D) Down syndrome - Trisomy 21
(E) Answer not known

81. Consider the following statements regarding oral health:
I. Dental caries is caused by acid-producing bacteria acting on fermentable carbohydrates.
II. Oral cancer is strongly associated with tobacco chewing and smoking.
III. Periodontal disease only affects the teeth and not the gums.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I only
(E) Answer not known

82. What is the definition of a congenital disease?
(A) A disease acquired through lifestyle choices.
(B) A medical condition that is present at or before birth.
(C) An infection transmitted via a biological vector.
(D) A psychological disorder developing in late adulthood.
(E) Answer not known

83. Match the items in List I with those in List II and select the correct option:
List I: (Vector/Carrier)
P. Aedes aegypti
Q. Housefly
R. Tick
S. Culex mosquito
List II: (Disease)
I. Lyme disease
II. Japanese Encephalitis
III. Chikungunya
IV. Cholera
(A) P-III, Q-IV, R-I, S-II
(B) P-II, Q-IV, R-III, S-I
(C) P-III, Q-I, R-IV, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

84. Which vitamin deficiency is historically known to cause scurvy?
(A) Vitamin C
(B) Vitamin A
(C) Vitamin B12
(D) Vitamin D
(E) Answer not known

85. Consider the following statements regarding the role of clean water in disease control:
I. It prevents the spread of diseases like cholera and typhoid.
II. Proper sanitation reduces the breeding grounds for mosquitoes.
III. Safe drinking water is essential only in urban areas.
IV. Boiling water kills most waterborne pathogens.
Which of the above statements are correct?
(A) I, II and IV only

NODIA

an antibiotic can mutate and multiply, passing resistance traits to their offspring.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

40. Which of the following pairs of zoonotic diseases and their common reservoirs is incorrectly matched?
(A) Nipah virus - Fruit bats
(B) Bird flu - Cattle
(C) Rabies - Dogs
(D) Swine flu - Pigs
(E) Answer not known

41. Consider the following statements regarding Non-Communicable Diseases (NCDs):
I. They are mainly caused by a combination of genetic, physiological, environmental, and behavioral factors.
II. NCDs are responsible for a small minority of global deaths compared to infectious diseases.
III. Cardiovascular diseases and cancers are major types of NCDs.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I only
(E) Answer not known

42. What is the definition of hypertension?
(A) A medical condition featuring abnormally low blood sugar concentrations.
(B) A chronic respiratory disease characterized by persistent airway inflammation.
(C) A complex metabolic disorder that prevents efficient protein breakdown.
(D) Persistently elevated blood pressure measured within the arterial walls.
(E) Answer not known

43. Match the items in List I with those in List II and select the correct option:
List I: (Non-Communicable Disease)
P. Type 2 Diabetes
Q. Lung Cancer
R. Cirrhosis
S. Chronic Kidney Disease
List II: (Primary Risk Factor)
I. Tobacco smoking
II. Heavy alcohol consumption
III. Uncontrolled hypertension
IV. Obesity and poor diet
(A) P-IV, Q-I, R-II, S-III
(B) P-I, Q-IV, R-III, S-II
(C) P-IV, Q-II, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

44. Which hormone's deficiency or ineffective use leads to Diabetes Mellitus?
(A) Glucagon
(B) Insulin
(C) Thyroxine
(D) Adrenaline
(E) Answer not known

45. Consider the following statements about Type 1 and Type 2 Diabetes:
I. Type 1 diabetes is characterized by an autoimmune destruction of insulin-producing beta cells.
II. Type 2 diabetes is largely linked to lifestyle factors such as obesity.
III. Type 1 diabetes is more common than Type 2 diabetes globally.
IV. Both types can lead to complications like neuropathy and retinopathy.
Which of the above statements are correct?
(A) I, II and IV only
(B) I, III and IV only
(C) II, III and IV only
(D) I and II only
(E) Answer not known

46. What is the most common warning sign of coronary artery disease?
(A) Angina (chest pain)
(B) Sudden hair loss
(C) Chronic cough
(D) Visual impairment
(E) Answer not known

47. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:

Downloaded from www.pdf.tube

(A) Notifying the IDSP, isolating cases, and initiating investigation.
(B) Declaring a total nationwide lockdown for all citizens.
(C) Prescribing broad-spectrum antibiotics to the entire district.
(D) Halting all municipal water supplies for the affected area.
(E) Answer not known

95. Consider the following statements about mental disorders:
I. Depression is a leading cause of disability worldwide.
II. Schizophrenia involves distorted thinking and perception.
III. Anxiety disorders are purely genetic and unaffected by environment.
IV. Awareness campaigns aim to reduce stigma surrounding mental health.
V. Therapy and medication are common management strategies.
Which of the above statements are correct?
(A) I, II, IV and V only
(B) I, II, III, IV and V
(C) II, III, IV and V only
(D) I, III and IV only
(E) Answer not known

96. An unusual spike in fever and rash cases reported by rural health workers should trigger:
(A) Taking disciplinary action against rural health workers.
(B) Deployment of the Rapid Response Team by the District Unit.
(C) Closing all local businesses within the region permanently.
(D) Initiating the nationalization of all local hospitals.
(E) Answer not known

97. Match the items in List I with those in List II and select the correct option:
List I: (Mental Health Disorder)
P. Depression
Q. Anxiety disorder
R. Schizophrenia
S. Bipolar disorder
List II: (Characteristic Symptom)
I. Delusions and hallucinations
II. Alternating mania and depression
III. Persistent low mood and lethargy
IV. Chronic excessive worry
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-I, Q-II, R-III, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

98. Based on classification, silicosis and asbestosis are types of:
(A) Genetic diseases
(B) Occupational diseases
(C) Zoonotic diseases
(D) Vector-borne diseases
(E) Answer not known

99. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): The National Diabetes Programme focuses heavily on lifestyle modification.
Reason (R): Type 2 diabetes, which forms the vast majority of cases, is strongly linked to diet, exercise, and weight management.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

100. Which of the following pairs of diseases and their primary preventive measures is incorrectly matched?
(A) Haemophilia - Regular physical exercise
(B) Malaria - Mosquito nets
(C) Cholera - Clean drinking water
(D) Tuberculosis - BCG vaccination
(E) Answer not known

101. Consider the following statements regarding the National Immunisation Schedule:
I. Rotavirus vaccine prevents severe diarrhoea in infants.
II. The pentavalent vaccine protects against five diseases including Hepatitis B and Hib.
III. Tetanus toxoid is only given to pregnant women and never to children.

NODIA

→ District Surveillance Unit → State Surveillance Unit → Central Surveillance Unit
(B) Primary Health Center → Sub-center → State Surveillance Unit → District Surveillance Unit → Central Surveillance Unit
(C) District Surveillance Unit → Sub-center → Primary Health Center → Central Surveillance Unit → State Surveillance Unit
(D) Central Surveillance Unit → State Surveillance Unit → District Surveillance Unit → Primary Health Center → Sub-center
(E) Answer not known

72. Which of the following is NOT a core component of the Integrated Disease Surveillance Programme (IDSP)?
(A) Integration of decentralized surveillance activities
(B) Providing universal health insurance to poor families
(C) Early warning signals for timely outbreak response
(D) Training of medical officers and health workers
(E) Answer not known

73. Arrange the phases of pandemic management in the correct logical sequence.
I. Containment and mitigation
II. Preparedness and anticipation
III. Recovery and evaluation
IV. Early detection and outbreak response
(A) II, IV, I, III
(B) IV, I, II, III
(C) II, I, IV, III
(D) I, II, III, IV
(E) Answer not known

74. What is the most appropriate role of the Indian Council of Medical Research (ICMR) during an epidemic?
(A) Enforcing laws and monitoring international border control points.
(B) Managing the distribution of food rations to various affected zones.
(C) Providing direct financial assistance to all infected individuals.
(D) Formulating research strategies, guidelines, and approving test kits.
(E) Answer not known

75. Consider the following statements regarding the role of WHO during a pandemic:
I. It declares Public Health Emergencies of International Concern (PHEIC).
II. It issues global health guidelines and protocols.
III. It directly governs the health ministries of member nations.
IV. It coordinates the global distribution of vaccines through initiatives like COVAX.
V. It funds the complete healthcare budget of developing countries.
Which of the above statements are correct?
(A) I, II and IV only
(B) I, II, III and IV only
(C) II, IV and V only
(D) I, III and V only
(E) Answer not known

76. An industrial worker from a textile factory presents with chronic tightness in the chest that worsens on the first day of the workweek. What is the most likely diagnosis?
(A) Silicosis
(B) Byssinosis
(C) Asbestosis
(D) Plumbism
(E) Answer not known

77. Match the items in List I with those in List II and select the correct option:
List I: (Government Initiative)
P. PM-JAY
Q. IHIP (Integrated Health Information Platform)
R. IDSP
S. NACP
List II: (Objective)
I. HIV/AIDS control
II. Decentralized disease surveillance
III. Real-time data reporting for diseases
IV. Universal health coverage
(A) P-IV, Q-III, R-II, S-I
(B) P-III, Q-IV, R-I, S-II
(C) P-IV, Q-II, R-III, S-I
(D) P-I, Q-III, R-II, S-IV
(E) Answer not known

Click Here to Buy book on Amazon

(D) Encouraging self-medication practices for all minor fevers.
(E) Answer not known

109. Which of the following pairs is correctly matched regarding viral hepatitis?
(A) Hepatitis A - Chronic liver cirrhosis as primary outcome
(B) Hepatitis B - Preventable by vaccination
(C) Hepatitis C - Spread through contaminated food
(D) Hepatitis E - Primarily bloodborne transmission
(E) Answer not known

110. When comparing communicable and non-communicable diseases (NCDs), which statement is accurate?
(A) NCDs generally have longer duration and slower progression.
(B) Communicable diseases are always chronic while NCDs are acute.
(C) Only communicable diseases pose a burden on the health system.
(D) NCDs can be completely eradicated through mass vaccination.
(E) Answer not known

111. Select the correct sequential progression of the pathogenesis of Tuberculosis.
(A) Inhalation of bacilli → Phagocytosis by alveolar macrophages → Granuloma formation → Caseous necrosis → Cavitation
(B) Granuloma formation → Inhalation of bacilli → Cavitation → Phagocytosis by alveolar macrophages → Caseous necrosis
(C) Phagocytosis by alveolar macrophages → Inhalation of bacilli → Caseous necrosis → Granuloma formation → Cavitation
(D) Inhalation of bacilli → Cavitation → Granuloma formation → Phagocytosis by alveolar macrophages → Caseous necrosis
(E) Answer not known

112. A distinguishing feature of asthma compared to other respiratory diseases is:
(A) The complete and irreversible destruction of all alveoli.
(B) The constant presence of a bacterial pathogen in sputum.
(C) Permanent stiffening of the tissues within the lung area.
(D) Reversible airway obstruction and episodes of bronchospasm.
(E) Answer not known

NODIA

113. Arrange the stages of an epidemic investigation in order:
I. Confirm the diagnosis
II. Establish the existence of an outbreak
III. Implement control and prevention measures
IV. Define and identify cases
(A) II, I, IV, III
(B) I, II, III, IV
(C) II, IV, I, III
(D) IV, I, II, III
(E) Answer not known

114. Which of the following is an example of a waterborne disease?
(A) Dengue
(B) Typhoid
(C) Tuberculosis
(D) Ringworm
(E) Answer not known

115. Consider the following statements regarding the Ayushman Bharat PM-JAY:
I. It is the world's largest government-funded health assurance scheme.
II. It covers pre-hospitalization and post-hospitalization expenses.
III. There is no cap on family size or age.
IV. Beneficiaries are identified based on the SECC database.
V. It only provides primary healthcare services.
Which of the above statements are correct?
(A) I, II, III and IV only
(B) I, II, IV and V only
(C) II, III, IV and V only
(D) I, III and V only
(E) Answer not known

116. Which of the following lifestyle modifications is most relevant for managing hypertension?
(A) Reducing dietary salt and engaging in regular aerobic exercise.
(B) Increasing the daily intake of sodium through diet alone.
(C) Adopting a sedentary routine to allow the heart more rest.
(D) Consuming diets that are consistently high

in trans-fats.
(E) Answer not known

117. Match the items in List I with those in List II and select the correct option:
List I: (Cancer Warning Sign)
P. A sore that does not heal
Q. Unusual bleeding or discharge
R. Thickening or lump in tissue
S. Obvious change in a wart or mole
List II: (Clinical Description)
I. Potential sign of breast or testicular cancer
II. Potential sign of skin cancer (Melanoma)
III. Potential sign of cervical or colorectal cancer
IV. Potential sign of oral or skin carcinoma
(A) P-IV, Q-III, R-I, S-II
(B) P-III, Q-IV, R-II, S-I
(C) P-IV, Q-I, R-III, S-II
(D) P-I, Q-II, R-IV, S-III
(E) Answer not known

118. When comparing bacterial and viral diseases, which of the following statements is true?
(A) Viruses require host cells, whereas most bacteria multiply alone.
(B) Both types can be effectively treated with antibiotic cycles.
(C) Viral diseases are always fatal while bacterial ones are mild.
(D) Bacteria are non-cellular while viruses are single-celled.
(E) Answer not known

119. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): The incidence of Dengue usually peaks during and immediately after the monsoon season.
Reason (R): Rainwater accumulates in open containers and debris, providing ideal breeding grounds for Aedes mosquitoes.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

120. Which of the following pairs of liver diseases and their causes is incorrectly matched?
(A) Alcoholic cirrhosis - Chronic heavy drinking
(B) Hepatic failure - Vitamin A deficiency
(C) Non-alcoholic fatty liver - Obesity and insulin resistance
(D) Hepatitis B - Viral infection
(E) Answer not known

121. Consider the following statements about fungal diseases:
I. Ringworm is caused by a group of fungi called dermatophytes.
II. Candidiasis commonly affects the mucous membranes.
III. Aspergillosis primarily affects the nervous system.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I only
(E) Answer not known

122. What defines a 'pandemic'?
(A) The habitual presence of a disease within a geographic area.
(B) A sudden spike of disease cases localized to one community.
(C) A disease that affects primarily domestic animal populations.
(D) An epidemic occurring globally or over a very wide area.
(E) Answer not known

123. Match the items in List I with those in List II and select the correct option:
List I: (Genetic/Congenital Disease)
P. Down syndrome
Q. Haemophilia
R. Sickle cell anaemia
S. Cystic fibrosis
List II: (Mechanism)
I. Point mutation affecting hemoglobin structure
II. X-linked recessive bleeding disorder
III. Trisomy of chromosome 21
IV. Defective chloride channel transport
(A) P-III, Q-II, R-I, S-IV
(B) P-III, Q-I, R-II, S-IV
(C) P-II, Q-III, R-I, S-IV

Downloaded from www.pdf.tube

(D) P-IV, Q-II, R-III, S-I
(E) Answer not known

124. Which of the following pathogens is a protozoan responsible for sleeping sickness?
(A) Plasmodium falciparum
(B) Trypanosoma brucei
(C) Leishmania donovani
(D) Entamoeba histolytica
(E) Answer not known

125. Consider the following statements regarding the DOTS strategy:
I. DOTS stands for Directly Observed Treatment, Short-course.
II. It involves the direct supervision of patients taking their medication.
III. It is specifically designed to treat HIV/AIDS.
IV. Sputum smear microscopy is a key diagnostic component of DOTS.
Which of the above statements are correct?
(A) I, II and IV only
(B) I, III and IV only
(C) II, III and IV only
(D) I and II only
(E) Answer not known

126. Which of the following is an example of a fungal disease?
(A) Aspergillosis
(B) Ascariasis
(C) Filariasis
(D) Amoebic dysentery
(E) Answer not known

127. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): Type 2 diabetes is often termed a "lifestyle disease".
Reason (R): Sedentary habits, poor diet, and resulting obesity are major contributing factors to its onset.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

128. What is the most relevant approach to controlling the spread of antimicrobial resistance (AMR)?
(A) Using antibiotics for viral colds to prevent secondary infection.
(B) Stopping all vaccination programmes currently in operation.
(C) Breeding resistant bacteria for competitive immunity purposes.
(D) Implementing infection control and antibiotic stewardship.
(E) Answer not known

129. Which of the following pairs is correctly matched regarding National Health Programmes?
(A) NACP - Control of Polio
(B) IDSP - Control of Tuberculosis
(C) NPCB - Control of Blindness
(D) PM-JAY - Control of Malaria
(E) Answer not known

130. When comparing Hepatitis A and Hepatitis C, which statement is true?
(A) Both are primarily transmitted via the faecal-oral route.
(B) Hepatitis A is usually acute while C often becomes chronic.
(C) Both are curable with the exact same vaccination protocol.
(D) Hepatitis C virus causes immediate liver failure in patients.
(E) Answer not known

131. Select the correct order of the typical stages in the life cycle of the mosquito vector (Aedes/Anopheles).
I. Egg
II. Larva
III. Pupa
IV. Adult
(A) Egg → Larva → Pupa → Adult
(B) Larva → Egg → Pupa → Adult
(C) Egg → Pupa → Larva → Adult
(D) Pupa → Larva → Egg → Adult
(E) Answer not known

132. A prominent clinical feature of cholera is:
(A) Rice-water stools accompanied by severe dehydration levels.
(B) High persistent fever with characteristic rose spot rashes.
(C) Paralysis affecting the muscles of the lower

NODIA

vaccination campaign.
Reason (R): Smallpox only infects humans, has no animal reservoir, and the vaccine provided long-lasting immunity.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

148. A rapid rise in AMR (Antimicrobial Resistance) in a hospital implies that:
(A) Standard antibiotics are becoming ineffective against bacteria.
(B) The hospital environment is maintained as completely sterile.
(C) Patients are recovering much faster than they were before.
(D) Viral diseases are mutating directly into bacterial forms.
(E) Answer not known

149. Which of the following correctly describes a characteristic of immunity?
(A) Innate immunity is developed after a natural infection.
(B) Acquired immunity is present from the moment of birth.
(C) Active immunity is produced by one's own body in response to a specific antigen.
(D) Passive immunity provides long-lasting immunological memory.
(E) Answer not known

150. A key disadvantage of live attenuated vaccines compared to inactivated vaccines is:
(A) Can cause disease in individuals with weak immune systems.
(B) Provide significantly shorter immunity than other vaccines.
(C) Always require multiple booster doses to remain effective.
(D) Do not stimulate a cellular immune response in the patient.
(E) Answer not known

151. Select the correct chronological order of the steps involved in water purification to prevent waterborne diseases at a municipal level.
(A) Sedimentation → Filtration → Coagulation → Disinfection
(B) Coagulation → Sedimentation → Filtration → Disinfection
(C) Filtration → Coagulation → Disinfection → Sedimentation
(D) Disinfection → Filtration → Sedimentation → Coagulation
(E) Answer not known

152. If a public health study finds a direct correlation between high sugar diets, low physical activity, and increased insulin resistance, it can be inferred that this population is at high risk for:
(A) Type 1 Diabetes
(B) Type 2 Diabetes
(C) Dengue fever
(D) Sickle cell anaemia
(E) Answer not known

153. Arrange the progression of liver damage caused by chronic alcohol consumption.
I. Cirrhosis
II. Fatty liver (Steatosis)
III. Hepatic failure
IV. Alcoholic hepatitis
(A) II, IV, I, III
(B) IV, II, I, III
(C) II, I, IV, III
(D) I, II, III, IV
(E) Answer not known

154. What is the primary advantage of establishing Health and Wellness Centres under the Ayushman Bharat scheme?
(A) Centralizing complex organ transplant surgeries in one state.
(B) Replacing traditional medicine entirely with modern techniques.
(C) Providing free housing for the rural poor across the nation.
(D) Delivering comprehensive primary care closer to the community.
(E) Answer not known

155. Consider the following statements regarding the role of WHO in epidemic management:
I. It monitors health trends globally.
II. It sets norms and standards for diagnostics.
III. It provides technical support to countries facing outbreaks.

Click Here to Buy book on Amazon

explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

140. Which of the following pairs of zoonotic diseases and their causative agents is incorrectly matched?
(A) Swine flu - H1N1 virus
(B) Nipah - Coronavirus
(C) Bird flu - H5N1 virus
(D) COVID-19 - SARS-CoV-2
(E) Answer not known

141. Consider the following statements about blindness and visual impairment in India:
I. Cataract is the leading cause of reversible blindness.
II. Vitamin A deficiency in children can lead to xerophthalmia and blindness.
III. Glaucoma involves damage to the optic nerve often due to high intraocular pressure.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I, II and III
(D) I and III only
(E) Answer not known

142. Which of the following categories does 'Byssinosis' belong to?
(A) Occupational disease
(B) Waterborne disease
(C) Genetic disease
(D) Zoonotic disease
(E) Answer not known

143. Match the items in List I with those in List II and select the correct option:
List I: (Symptom/Sign)
P. Hydrophobia (fear of water)
Q. Swelling of lymph nodes (Buboes)
R. Severe joint pain (Polyarthralgia)
S. Jaundice (Yellowing of skin/eyes)
List II: (Related Disease)
I. Chikungunya
II. Plague
III. Hepatitis
IV. Rabies
(A) P-IV, Q-II, R-I, S-III
(B) P-II, Q-IV, R-III, S-I
(C) P-IV, Q-I, R-II, S-III
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

144. From the fact that a patient suffering from prolonged cough, night sweats, and weight loss tests positive in sputum microscopy, one can infer the patient likely has:
(A) Asthma
(B) Malaria
(C) Cholera
(D) Tuberculosis
(E) Answer not known

145. Consider the following statements regarding Malaria prevention and treatment:
I. Indoor residual spraying helps reduce mosquito populations.
II. Artemisinin-based combination therapies (ACTs) are effective treatments for P. falciparum.
III. Long-lasting insecticidal nets (LLINs) provide a physical and chemical barrier against vectors.
IV. Drinking boiled water effectively prevents malaria transmission.
Which of the above statements are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I and II only
(E) Answer not known

146. A major advantage of the Ayushman Bharat PM-JAY scheme is that it:
(A) Provides free treatment for minor colds at tertiary hospitals.
(B) Reduces out-of-pocket spending for catastrophic health events.
(C) Funds luxury treatments and cosmetic surgeries for the elite.
(D) Focuses exclusively on providing veterinary healthcare services.
(E) Answer not known

147. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): The eradication of smallpox was possible largely due to an effective global

Downloaded from www.pdf.tube

ANSWERS

1. (C) I and III only
Tuberculosis and cholera are both bacterial diseases caused by specific pathogens, namely Mycobacterium tuberculosis and Vibrio cholerae. While tuberculosis primarily affects the respiratory system through airborne droplets, cholera is an acute diarrhoeal infection caused by ingestion of contaminated food or water. In contrast, typhoid fever is also bacterial but spreads through the faecal-oral route rather than droplet infection.

2. (B) A condition not caused by pathogens and not transmissible between individuals.
Non-communicable diseases are chronic medical conditions that are generally characterized by a slow progression and long duration. Unlike infectious diseases, these conditions are not caused by acute infections with pathogens and cannot be spread from one person to another. Common examples include cardiovascular diseases, various cancers, chronic respiratory illnesses, and metabolic disorders such as diabetes or hypertension.

3. (A) P-III, Q-I, R-IV, S-II
Pathogen classification is essential for understanding disease mechanisms and treatments. Plasmodium vivax is a protozoan parasite causing malaria, while Candida albicans is an opportunistic fungus. Wuchereria bancrofti is a parasitic helminth responsible for lymphatic filariasis, and Salmonella typhi is the bacterium causing typhoid fever. These biological classifications guide the selection of appropriate antimicrobial, antifungal, or antiparasitic medical interventions.

4. (A) Treponema pallidum
Syphilis is a sexually transmitted bacterial infection caused by the spirochete bacterium Treponema pallidum. The disease progresses through several distinct clinical stages, starting with a painless sore known as a chancre. If left untreated, it can cause severe damage to the heart, brain, and other vital organs. Prevention and early diagnosis through blood testing remain critical global public health strategies.

5. (B) I, III and IV only
Viral diseases exhibit diverse modes of transmission depending on the specific virus involved. Dengue is spread through the bite of infected Aedes mosquitoes, while rabies is transmitted via the saliva of infected animals. Influenza is typically airborne, spreading through respiratory droplets. Unlike these, Hepatitis B is a bloodborne infection and is not primarily transmitted via contaminated food or water.

6. (A) Mycobacterium leprae
Leprosy, also known as Hansen's disease, is a chronic infectious disease caused by the slow-growing bacterium Mycobacterium leprae. It primarily affects the skin, the peripheral nerves, mucosal surfaces of the upper respiratory tract, and the eyes. If left untreated, the nerve damage can result in crippling of hands and feet, paralysis, and blindness. Early diagnosis remains the key.

7. (A) Both A and R are true and R is the correct explanation of A.
Vector-borne diseases like malaria are most prevalent in tropical and subtropical regions because the environmental conditions are ideal for the vectors. The warm and humid climate found in these areas significantly supports the survival, longevity, and rapid breeding of mosquito populations. Therefore, the climatic factors directly explain why these diseases occur more frequently in specific geographic zones.

8. (B) It leads to severe acute watery diarrhoea.
Cholera is an acute infection caused by the ingestion of food or water contaminated with the bacterium Vibrio cholerae. The hallmark symptom is the sudden onset of severe, painless, watery diarrhoea, often described as rice-water stools. This condition can rapidly lead to extreme dehydration and death if not treated promptly with rehydration therapy and appropriate antibiotics.

NODIA

IV. It conducts independent field trials without national consent.
V. It helps in capacity building of health workforce.

Which of the above statements are correct?
(A) I, II, III and V only
(B) I, II, III, IV and V
(C) II, III, IV and V only
(D) I, III and IV only
(E) Answer not known

156. Based on symptoms of severe weight loss, night sweats, chronic cough with blood-tinged sputum, one can infer the necessity of testing for:
(A) Cholera
(B) Tuberculosis
(C) Hepatitis A
(D) Malaria
(E) Answer not known

157. Match the items in List I with those in List II and select the correct option:
List I: (Mental Health Component)
P. Destigmatization
Q. Rehabilitation
R. Counseling
S. Pharmacotherapy
List II: (Focus Area)
I. Use of psychiatric medications
II. Reintegration of patients into society
III. Psychological therapy and support
IV. Increasing societal acceptance and awareness
(A) P-IV, Q-II, R-III, S-I
(B) P-III, Q-I, R-IV, S-II
(C) P-IV, Q-III, R-II, S-I
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

158. A major advantage of syndromic surveillance (as part of IDSP) is that it allows for:
(A) Faster detection of disease clusters based on symptoms alone.
(B) Definitive laboratory confirmation before any action is taken.
(C) The complete eradication of vector-borne diseases in India.
(D) Replacing physicians with automated software for diagnosis.
(E) Answer not known

159. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): Routine childhood immunization is one of the most cost-effective public health interventions.
Reason (R): It significantly prevents morbidity, mortality, and the lifelong disabilities associated with vaccine-preventable diseases.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

160. Which of the following pairs is correctly matched regarding modes of disease transmission?
(A) Airborne - Cholera
(B) Vector-borne - Rabies
(C) Droplet - Malaria
(D) Direct contact - Ringworm
(E) Answer not known

www.nodia.in

Click Here to Buy book on Amazon

18. (B) Nipah virus infection
Zoonotic diseases are infections that are naturally transmitted from vertebrate animals to humans. Nipah virus is a classic example, as it is primarily transmitted to humans from fruit bats or through intermediate hosts like pigs. In contrast, polio is a human-specific viral infection, while scurvy and sickle cell anaemia are nutritional and genetic conditions, respectively, not infectious.

19. (A) Both A and R are true and R is the correct explanation of A.
The DOTS programme is the fundamental strategy for tuberculosis control in India. It involves the direct observation of patients as they take their medication, which is crucial for ensuring treatment adherence. By guaranteeing that patients complete their full course of antibiotics, DOTS prevents the development of multidrug-resistant TB strains, which are much more difficult and expensive to treat.

20. (A) Hepatitis C - Currently preventable by a vaccine
Viral hepatitis is caused by different viruses with distinct transmission routes and prevention methods. Hepatitis A and E are spread through the faecal-oral route and contaminated water. Hepatitis B is bloodborne and preventable by a safe, effective vaccine. However, there is currently no widely available vaccine to prevent Hepatitis C, although highly effective antiviral medications can now cure it.

21. (B) I and III only
Malaria is a life-threatening disease caused by Plasmodium parasites, which are transmitted to people through the bites of infected female Anopheles mosquitoes. Once inside the human body, the parasites first travel to the liver to mature and multiply. They then enter and multiply within red blood cells. Symptoms typically include high fever, chills, and flu-like illness occurring in distinct patterns.

22. (A) Microorganisms surviving and growing despite medications intended to kill them.
Antimicrobial resistance occurs when bacteria, viruses, fungi, and parasites change over time and no longer respond to medicines. This makes infections harder to treat and increases the risk of disease spread, severe illness, and death. It is driven primarily by the misuse and overuse of antimicrobials in humans, animals, and plants, leading to the survival of resistant strains.

23. (A) P-IV, Q-I, R-III, S-II
Specific pathogens are responsible for distinct infectious diseases. Leishmania donovani causes kala-azar, while Entamoeba histolytica is the agent behind amoebic dysentery. Trypanosoma brucei is the protozoan responsible for sleeping sickness, and Trichophyton is a genus of fungi that causes ringworm infections. Proper identification of these causative agents is necessary for diagnosing and selecting the correct medical treatments.

24. (B) Bacillus Calmette-Guérin (BCG)
Under the National Immunisation Schedule in India, several vaccines are administered to infants to provide early protection against life-threatening diseases. The Bacillus Calmette-Guérin vaccine is specifically given at birth to protect newborns against severe forms of tuberculosis. Other vaccines like Measles-Rubella, DPT boosters, and Tetanus toxoid are scheduled at later stages of an infant's or child's development.

25. (A) I, II and III only
Dengue is a viral infection caused by a flavivirus and transmitted primarily by the bite of infected Aedes aegypti mosquitoes. A defining clinical symptom is severe muscle, bone, and joint pain, often leading to it being called breakbone fever. Because it is a viral disease, it cannot be treated with antibiotics, which are only effective against bacterial infections.

26. (D) COVID-19
Emerging infectious diseases are those that have recently appeared within a population or those whose incidence or geographic range is rapidly increasing. COVID-19, caused by the SARS-CoV-2 virus, is a prominent example of a newly emerged disease that caused a global pandemic. Diseases like plague, tuberculosis, and polio are well-established historical infections, some of which are now re-emerging.

NODIA

9. (C) Hepatitis A - Waterborne
Diseases are categorized based on how they spread within a population. Hepatitis A is a waterborne disease primarily transmitted through the ingestion of contaminated food or water. Tetanus is usually acquired through wound contamination rather than droplets, and measles is airborne rather than vector-borne. Ringworm is a fungal infection spread through direct contact rather than by being airborne.

10. (D) Tapeworm infections are transmitted via mosquito bites.
Helminthic diseases are caused by parasitic worms like roundworms and tapeworms. Ascariasis is caused by Ascaris lumbricoides, while filariasis targets the lymphatic system. Poor sanitation and hygiene facilitate the spread of these parasites. However, tapeworm infections are typically transmitted through the ingestion of undercooked contaminated meat or eggs in food and water, rather than via mosquito bites.

11. (A) Infectious agent → Reservoir → Portal of exit → Mode of transmission → Portal of entry → Susceptible host
The chain of infection describes the specific steps required for a pathogen to spread. It begins with an infectious agent residing in a reservoir. The agent leaves the reservoir through a portal of exit and is spread via a mode of transmission. It then enters a new host through a portal of entry, affecting a susceptible individual.

12. (B) Cholera
Airborne diseases are caused by pathogens that can be transmitted through small droplets or particles suspended in the air. Examples include tuberculosis, measles, and chickenpox. Cholera, however, is a waterborne disease caused by the bacterium Vibrio cholerae. It spreads primarily through the ingestion of contaminated water or food and is not transmitted through the inhalation of air.

13. (B) II, III, I, IV
Rabies infection follows a predictable clinical progression in humans. It begins with an incubation period where the virus travels to the nervous system. This is followed by the prodromal phase, characterized by non-specific symptoms. Next, the encephalitis phase involves acute neurological dysfunction, eventually leading to a coma and death. This sequence highlights the fatal nature of the disease.

14. (A) Providing safely managed drinking water and improved sanitation infrastructure.
Primary prevention for waterborne diseases focuses on eliminating the source of infection before it reaches individuals. Providing safely managed drinking water and improving sanitation infrastructure are the most effective strategies to prevent the spread of pathogens like those causing cholera and typhoid. While vaccination and rehydration are important, they represent secondary measures or specific interventions for already existing risks.

15. (A) I, II, IV and V only
HIV targets the immune system, specifically CD4 cells, and can be transmitted through various body fluids, including breast milk. AIDS represents the most advanced stage of the infection. While India implements the National AIDS Control Programme, current antiretroviral therapy manages the condition but does not provide a complete cure. Therefore, statements regarding the immune system and transmission are accurate.

16. (D) Chikungunya
During monsoon outbreaks, stagnant water promotes the breeding of Aedes mosquitoes, which are vectors for Chikungunya. The disease is characterized by the sudden onset of high fever, severe and often debilitating joint pain, and skin rashes. These specific clinical features, particularly the intense joint pain, distinguish it from other febrile illnesses like typhoid, cholera, or chronic tuberculosis.

17. (A) P-IV, Q-III, R-II, S-I
Different insects serve as vectors for specific infectious diseases. The Anopheles mosquito transmits malaria, while the Culex mosquito is responsible for spreading filariasis. The sandfly is the vector for kala-azar, a parasitic disease, and the tsetse fly transmits sleeping sickness in certain regions. Understanding these relationships is vital for implementing effective vector control strategies to prevent outbreaks.

Downloaded from www.pdf.tube

body limbs.
(D) Swelling occurring in the major parotid salivary glands.
(E) Answer not known

133. Arrange the chronological steps of managing a diabetic patient under the National Diabetes Programme.
I. Lifestyle modification counselling
II. Screening for high blood sugar
III. Initiation of oral hypoglycemic agents
IV. Management of diabetic complications (e.g., retinopathy)
(A) II, I, III, IV
(B) I, II, III, IV
(C) II, III, I, IV
(D) III, II, IV, I
(E) Answer not known

134. Which of the following is categorized as a helminthic disease?
(A) Ascariasis
(B) Ringworm
(C) Kala-azar
(D) Candidiasis
(E) Answer not known

135. Consider the following statements about cancer treatments:
I. Surgery involves the physical removal of the tumor.
II. Chemotherapy uses specific drugs to kill cancer cells.
III. Radiation therapy uses high doses of radiation to destroy cancer cells.
IV. Immunotherapy helps the body's immune system fight the cancer.
V. Palliative care aims to cure advanced stage cancers completely.
Which of the above statements are correct?
(A) I, II, III and IV only
(B) I, II, III, IV and V
(C) II, III, IV and V only
(D) I, III and V only
(E) Answer not known

136. Which public health measure is most relevant for reducing the global burden of chronic respiratory diseases like COPD?
(A) Promoting the consumption of unboiled local drinking water.
(B) Tobacco control and reducing indoor and outdoor air pollution.
(C) Mass distribution of antimalarial drugs to the population.
(D) Encouraging diets that are consistently high in sugar content.
(E) Answer not known

137. Match the items in List I with those in List II and select the correct option:
List I: (Disease)
P. Rabies
Q. Tuberculosis
R. Polio
S. COVID-19
List II: (Preventative Measure/Vaccine)
I. BCG vaccine
II. Post-exposure prophylaxis vaccine
III. Oral or Inactivated vaccine
IV. mRNA or viral vector vaccine
(A) P-II, Q-I, R-III, S-IV
(B) P-I, Q-II, R-IV, S-III
(C) P-II, Q-III, R-I, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

NODIA

138. The defining feature of a "vector" in infectious diseases is that it:
(A) The actual microscopic pathogen that causes the disease.
(B) An inanimate object like a doorknob that harbors bacteria.
(C) The primary medication used to treat the specific infection.
(D) Transmits a pathogen between hosts without being affected.
(E) Answer not known

139. The following question consists of two statements, an Assertion (A) and a Reason (R). Select the correct answer using the options below:
Assertion (A): The Integrated Health Information Platform (IHIP) enhances India's disease surveillance.
Reason (R): IHIP enables real-time, case-based data entry and geotagging of disease outbreaks via mobile devices.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct

27. (A) Both A and R are true and R is the correct explanation of A.
Fungal infections like candidiasis are often termed opportunistic because they typically occur when the host's natural defenses are weakened. A healthy immune system is capable of keeping various fungal pathogens in check, preventing them from causing disease. In immunocompromised individuals, such as those with HIV or undergoing chemotherapy, these fungi can multiply uncontrollably, leading to significant clinical infections.

28. (B) It offers monthly nutritional support to notified TB patients.
The Nikshay Poshan Yojana is a government initiative in India specifically designed to support patients diagnosed with tuberculosis. Recognizing that malnutrition hinders recovery, the scheme provides a monthly financial incentive to all notified TB patients for the duration of their treatment. This financial aid is intended to help patients meet their nutritional requirements and improve their treatment outcomes.

29. (B) Malaria - Protozoa
Diseases are classified based on the biological nature of their causative agents. Malaria is caused by Plasmodium, which is a protozoan parasite. Ringworm is a fungal infection, not helminthic. Typhoid fever is a bacterial disease caused by Salmonella typhi, not viral. Chikungunya is a viral infection transmitted by mosquitoes, not a bacterial one. Accurate pathogen matching is essential.

30. (A) The virus multiplies using the host's red blood cells.
COVID-19 is caused by the SARS-CoV-2 virus, which primarily targets the respiratory system by entering cells via ACE2 receptors, mostly found in lung tissues. It is transmitted through respiratory droplets during close contact. While vaccines like Covishield and Covaxin were used in India, the virus does not multiply in red blood cells; instead, it uses the host cell's machinery.

31. (A) Binding → Reverse transcription → Integration → Replication → Budding
The HIV life cycle involves several complex steps starting with binding and entry into the host CD4 cell. The virus uses reverse transcriptase to convert its RNA into DNA, which then integrates into the host's genome. Following replication and assembly of new viral components, the mature virus buds from the cell membrane to infect other healthy immune cells within the body.

32. (D) Total eradication of the HIV virus from the population by 2025.
The National AIDS Control Programme in India focuses on preventing new infections, providing free antiretroviral therapy, and increasing public awareness to reduce stigma. While the program aims to significantly reduce the impact of HIV and prevent parent-to-child transmission, the total biological eradication of the virus from the entire population by 2025 is not a realistic or stated official objective.

33. (A) I, IV, III, II
The life cycle of the malaria parasite begins when an infected mosquito injects sporozoites into the human bloodstream. These parasites quickly travel to the liver, where they multiply and develop into merozoites. These merozoites then enter the red blood cells, causing symptoms when they burst out. Eventually, gametocytes are formed, which are then ingested by another mosquito during feeding.

34. (B) Issuing boil-water advisories and conducting thorough water quality testing.
Managing an outbreak of waterborne disease requires immediate action to break the transmission cycle. Issuing boil-water advisories ensures that pathogens in the water are killed before consumption. Simultaneously, conducting thorough water quality testing helps identify the contamination source. These public health measures are more appropriate and effective than administering universal antibiotics or enforcing community-wide isolation without clear cause.

35. (B) I, II, III, IV and V
Vaccines work by stimulating the immune system to produce antibodies and memory cells. Live attenuated vaccines use weakened pathogens, while inactivated vaccines use killed ones and often require boosters. Toxoid vaccines target the harmful toxins produced by bacteria. Collectively, these methods create herd immunity, which protects the entire community, including those who cannot be medically vaccinated themselves.

Click Here to Buy book on Amazon

focuses on replacing the filtration function of the kidneys. This is achieved either through regular dialysis sessions to remove waste from the blood or through a kidney transplantation surgery. These are the only effective long-term strategies for patient survival.

55. (B) I, II, III and IV only
Cirrhosis is the advanced scarring of the liver caused by long-term damage, frequently due to alcohol abuse or fatty liver disease linked to obesity. The liver can fail suddenly or gradually over time. Contrary to the idea that it has no regenerative capacity, the liver is actually known for its remarkable ability to repair itself after mild to moderate injury.

56. (B) Stroke
A stroke occurs when the blood supply to part of the brain is interrupted or reduced, preventing brain tissue from getting oxygen and nutrients. Classic emergency signs include sudden facial drooping, weakness in one arm, and slurred or difficult speech. These symptoms require immediate medical attention to minimize brain damage and are distinct from a heart attack or chronic hypertension.

57. (A) P-II, Q-III, R-IV, S-I
Diseases are categorized based on their primary characteristics and causes. Asthma is a chronic respiratory disease affecting the airways. Schizophrenia is a severe mental disorder that impacts how a person thinks and feels. Dental caries is a common oral health disease involving tooth decay. Down syndrome is a genetic condition caused by chromosomal abnormalities, specifically an extra copy of chromosome 21.

58. (D) Genetic diseases
Haemophilia is a rare inherited disorder in which the blood does not clot normally because it lacks sufficient blood-clotting proteins. It is a genetic disease, typically passed from parents to children through the X chromosome. It is not caused by lifestyle choices, occupational hazards, or animal-to-human transmission. Patients with this condition may bleed for a longer time after an injury.

59. (A) Both A and R are true and R is the correct explanation of A.
Lifestyle diseases are non-communicable conditions that arise due to the way people live. In urban areas of Tamil Nadu, factors such as decreased physical activity, high intake of processed foods, and increased stress contribute to these ailments. Because these environmental and behavioral shifts directly drive disease prevalence, the link between urbanization and the rise of these conditions is valid.

60. (B) Bipolar disorder - Constant state of lethargy without any identifiable mood swings.
Mental disorders have distinct clinical presentations. Depression involves persistent sadness, while schizophrenia includes hallucinations. Anxiety disorders are marked by excessive fear. Bipolar disorder, however, is specifically characterized by significant mood swings, including episodes of emotional highs known as mania and emotional lows known as depression. It is not defined by a constant state of lethargy without any mood changes.

61. (A) I and II only
The National Programme for Control of Blindness aims to significantly reduce the prevalence of visual impairment in India. A major part of this initiative involves conducting cataract surgeries, as cataracts are a leading cause of reversible blindness. The programme also addresses other causes, including corneal blindness, through eye banking and transplantation services, rather than ignoring these critical eye health issues.

62. (A) Inflammation affecting the tissues that surround and support the teeth.
Periodontal disease, also known as gum disease, is a serious inflammatory condition that affects the tissues surrounding and supporting the teeth. It is primarily caused by the accumulation of bacterial plaque. If left untreated, it can lead to the destruction of the gums and the bone that supports the teeth, eventually resulting in tooth loss and other systemic health issues.

63. (A) P-III, Q-IV, R-I, S-II
Occupational lung diseases result from the prolonged inhalation of specific industrial dusts in the workplace. Silicosis is caused by silica dust, while asbestosis is linked to asbestos fibers.

NODIA

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

45. (A) I, II and IV only
Type 1 diabetes is an autoimmune condition where the body destroys insulin-producing cells, while Type 2 is largely driven by lifestyle factors like obesity and physical inactivity. Both types can lead to serious long-term complications, such as nerve damage and eye disease. Globally, Type 2 diabetes is far more common than Type 1, accounting for the vast majority.

46. (A) Angina (chest pain)
Coronary artery disease occurs when the major blood vessels supplying the heart become damaged or diseased, usually due to plaque buildup. A classic and most common warning sign is angina, which is a specific type of chest pain or discomfort caused by reduced blood flow to the heart muscle. Recognizing this symptom is crucial for the early diagnosis of heart conditions.

47. (A) Both A and R are true and R is the correct explanation of A.
A high Body Mass Index indicates obesity, which is a significant risk factor for cardiovascular diseases. Excess body fat can lead to several pathological conditions, including elevated blood pressure, abnormal levels of lipids in the blood, and the development of insulin resistance. These factors collectively strain the cardiovascular system, increasing the likelihood of heart attacks and other related conditions.

48. (D) Uncontrolled division of abnormal cells occurring within the body.
Cancer is a broad group of diseases characterized by the uncontrolled growth and spread of abnormal cells. These cells can invade nearby tissues and may eventually spread to other parts of the body through the blood and lymph systems. While some factors are hereditary, many cancers are linked to environmental exposures and lifestyle choices, rather than being exclusively bacterial infections.

49. (C) Carcinoma - Epithelial tissue
Cancers are classified based on the type of tissue in which they originate. Carcinomas are the most common type and arise from epithelial tissues that cover internal organs and the skin. In contrast, sarcomas occur in bone and soft tissues, while leukemias begin in blood-forming tissues. Lymphomas are cancers that specifically target the immune system's lymphatic cells and tissues.

50. (B) It is a curable disease if caught early.
Chronic Obstructive Pulmonary Disease is a progressive lung condition characterized by obstructed airflow and breathing difficulties. While the symptoms, such as chronic cough and shortness of breath, can be managed and the progression slowed, the damage to the lungs is generally irreversible. Therefore, COPD is not considered a curable disease, although early diagnosis and smoking cessation are vital.

NODIA

51. (B) Physical Exam → Imaging → Biopsy → Treatment Planning
The diagnostic pathway for cancer typically begins with a thorough physical examination to identify any obvious abnormalities. If a suspicion arises, imaging techniques like X-rays or CT scans are used to visualize internal structures. A biopsy is then performed to obtain tissue samples for laboratory confirmation. Only after a definitive diagnosis is made can a comprehensive treatment plan be developed.

52. (A) Age
Modifiable risk factors are behaviors and exposures that individuals can change to reduce their risk of disease. These include tobacco use, unhealthy diets, and physical inactivity. Age, along with genetics and gender, is considered a non-modifiable risk factor because it is a natural biological process that cannot be altered or controlled through lifestyle changes or medical interventions.

53. (A) II, IV, I, III
Body Mass Index is a standard tool used to categorize individuals based on their weight relative to their height. The classification starts with underweight for those with a low ratio, followed by normal weight. Overweight represents the next category, and obesity is the highest tier. These classifications help health professionals assess the potential risks for various metabolic and cardiovascular diseases.

54. (A) Dialysis or kidney transplantation
End-stage chronic kidney disease occurs when the kidneys can no longer function sufficiently to maintain life. At this stage, management

36. (A) Zoonosis
Zoonosis refers to the biological process where infectious diseases are naturally transmitted from vertebrate animals to humans. Public health workers studying these transmissions look at how pathogens like viruses or bacteria jump across species. This concept is critical for understanding emerging threats like Nipah, rabies, or avian influenza, which originate in animal populations before affecting human health.

37. (A) P-II, Q-IV, R-I, S-III
Different infectious diseases utilize specific modes of transmission to spread between hosts. Tuberculosis is primarily spread through respiratory droplets, while HIV is transmitted through infected body fluids. Cholera is a classic waterborne disease spread by contaminated water or food. Dengue is a vector-borne disease transmitted by the bite of infected mosquitoes. Knowing these modes is essential for implementing prevention.

38. (A) Measles (in populations with dropping vaccine coverage)
Re-emerging infectious diseases are those that were previously under control but are now increasing in incidence. Measles is a prime example, as outbreaks often occur when vaccination rates in a population decline. In contrast, smallpox is eradicated, and conditions like diabetes and cardiovascular disease are classified as non-communicable diseases rather than infectious diseases that can emerge or re-emerge.

39. (A) Both A and R are true and R is the correct explanation of A.
Antimicrobial resistance is a growing health threat driven by the misuse of antibiotics. When patients receive overprescribed antibiotics or fail to complete their full course, some bacteria may survive. These surviving bacteria can undergo genetic mutations that confer resistance, and they then multiply and pass these traits to future generations. This biological process directly results from inappropriate medical practices.

40. (B) Bird flu - Cattle
Zoonotic diseases have specific animal reservoirs where the pathogen naturally lives and reproduces. Nipah virus is associated with fruit bats, rabies is commonly found in dogs, and swine flu is linked to pig populations. Bird flu, as the name suggests, is primarily found in wild birds and poultry, not in cattle, which are not the common reservoir.

41. (B) I and III only
Non-communicable diseases are chronic conditions caused by a complex interaction of genetic, physiological, environmental, and behavioral factors. Major types include cardiovascular diseases and various cancers. Contrary to being a small minority, NCDs are actually responsible for the vast majority of global deaths annually. They represent a significant and growing burden on healthcare systems and economies worldwide.

42. (D) Persistently elevated blood pressure measured within the arterial walls.
Hypertension, commonly known as high blood pressure, is a medical condition where the force of the blood against the artery walls is consistently too high. This chronic state places extra strain on the heart and blood vessels. If left unmanaged, hypertension can lead to severe health complications, including heart attacks, strokes, and chronic kidney disease over time.

43. (A) P-IV, Q-I, R-II, S-III
Non-communicable diseases are strongly linked to specific modifiable risk factors. Type 2 diabetes is often associated with obesity and poor dietary habits, whereas lung cancer is primarily driven by tobacco smoking. Cirrhosis of the liver frequently results from heavy alcohol consumption, and chronic kidney disease is often a long-term complication resulting from uncontrolled and persistent high blood pressure.

44. (B) Insulin
Diabetes Mellitus is a chronic metabolic disorder characterized by high blood sugar levels. It occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is the vital hormone responsible for regulating blood glucose, allowing cells to absorb sugar for energy. Its deficiency leads to dangerous sugar accumulation.

Downloaded from www.pdf.tube

Byssinosis occurs among textile workers exposed to cotton dust, and anthracosis is common in coal miners exposed to coal dust. These conditions emphasize the necessity of using proper protective equipment and ventilation.

64. (D) Red blood cells adopting a rigid and crescent-like shape.
Sickle cell anaemia is an inherited blood disorder characterized by the production of abnormal hemoglobin. This causes red blood cells to become rigid and shaped like a crescent or sickle. These irregularly shaped cells can get stuck in small blood vessels, blocking blood flow and oxygen delivery to parts of the body, leading to pain, infections, and organ damage.

65. (A) I, II and III only
Down syndrome is a congenital genetic disorder caused by the presence of an extra copy of chromosome 21. This chromosomal abnormality results in characteristic facial features and varying degrees of intellectual disability. As a genetic condition occurring at conception, it cannot be prevented through dietary modifications during pregnancy, although prenatal screening can help in its early identification.

66. (B) Type 2 Diabetes
Lifestyle diseases are conditions primarily caused by the way individuals live their lives, including their diet and physical activity levels. Type 2 diabetes is a classic example, as it is strongly linked to obesity and a sedentary lifestyle. In contrast, cholera and rabies are infectious diseases, while haemophilia is a genetic condition that is inherited regardless of lifestyle choices.

67. (A) Both A and R are true and R is the correct explanation of A.
Engaging in regular physical exercise and ensuring adequate sleep are vital components of a healthy lifestyle. These practices help manage body weight, maintain normal blood pressure levels, and reduce psychological stress. By controlling these key risk factors, individuals can significantly lower their probability of developing cardiovascular diseases. The behavioral benefits directly explain the reduction in clinical disease risk.

68. (A) Providing accessible and high-quality healthcare services to all.
The National Health Mission is a major government initiative in India designed to ensure that all citizens have access to equitable, affordable, and high-quality healthcare. It encompasses both the National Rural Health Mission and the National Urban Health Mission. The focus is on strengthening health systems at all levels, rather than exclusively building specialized tertiary care hospitals or international programs.

NQDIA

69. (C) Health insurance cover of ₹5 lakhs per family each year.
Ayushman Bharat PM-JAY is a significant national health scheme in India that aims to provide financial protection against high medical costs. A key feature of this scheme is the provision of a health insurance cover of ₹5 lakhs per family per year for secondary and tertiary care hospitalization. This helps protect vulnerable families from catastrophic health expenditures that lead to poverty.

70. (A) The scheme is available only to citizens above 60 years of age.
Ayushman Bharat is a comprehensive national health initiative that includes Health and Wellness Centres and the PM-JAY insurance scheme. PM-JAY provides coverage for secondary and tertiary care in both public and private hospitals. Unlike some geriatric-specific programs, it is not limited only to citizens above 60; instead, it targets poor and vulnerable families based on specific socio-economic criteria.

71. (A) Sub-center → Primary Health Center → District Surveillance Unit → State Surveillance Unit → Central Surveillance Unit
The Integrated Disease Surveillance Programme in India operates through a structured hierarchy to monitor health trends. It begins at the sub-center level, moving up through Primary Health Centers to District Surveillance Units. Data is then consolidated at the State level before reaching the national Central Surveillance Unit. This systematic approach ensures early detection of outbreaks and facilitates rapid public response.

72. (B) Providing universal health insurance to poor families
The Integrated Disease Surveillance Programme focuses on monitoring disease trends and identifying outbreaks through decentralized activities and training. Its core components include early warning signals for timely responses and the integration of surveillance data. While providing universal health insurance is a vital part of other national programs like Ayushman Bharat, it is not an objective of the surveillance-focused IDSP.

73. (A) II, IV, I, III
Effective pandemic management involves a logical progression of actions. It begins with preparedness and anticipation, followed by early detection and rapid outbreak response when a threat emerges. Once a pandemic is established, the focus shifts to containment and mitigation strategies. Finally, the recovery and evaluation phase allows health systems to restore services and learn from the experience to improve.

74. (D) Formulating research strategies, guidelines, and approving test kits.
The Indian Council of Medical Research serves as the apex body in India for the formulation, coordination, and promotion of biomedical research. During an epidemic, its primary role involves developing scientific research strategies, issuing clinical management guidelines, and evaluating and approving diagnostic test kits. These research-oriented functions are distinct from legal enforcement, food distribution, or direct financial assistance to patients.

75. (A) I, II and IV only
The World Health Organization plays a leading role in global health by declaring international emergencies and setting health standards. It coordinates global initiatives like COVAX for vaccine distribution. While it provides expert guidance and technical support, it does not directly govern the internal health ministries of sovereign nations or fully fund the entire healthcare budgets of any specific countries.

76. (B) Byssinosis
Byssinosis is an occupational lung disease caused by the inhalation of cotton, flax, or hemp dust, typically occurring among workers in the textile industry. A characteristic clinical feature is chest tightness that is most severe on the first day of the workweek after a break. This specific symptomatic pattern, known as Monday fever, helps distinguish it from other industrial lung conditions.

77. (A) P-IV, Q-III, R-II, S-I
India implements various health initiatives with specific goals. PM-JAY focuses on universal health coverage through insurance, while IHIP provides a platform for real-time disease data reporting. The IDSP is dedicated to decentralized disease surveillance across the country, and the NACP is the national strategy for HIV/AIDS control. These programs work together to address diverse public health challenges and improve outcomes.

78. (A) Disease surveillance and early warning electronic systems.
The Integrated Health Information Platform is a sophisticated digital system designed to enhance disease surveillance in India. It enables real-time, case-based data entry and provides early warning signals for potential outbreaks. This electronic platform allows health authorities to monitor disease trends more effectively than traditional methods, facilitating a faster and more targeted public health response to emerging health threats.

79. (A) Both A and R are true and R is the correct explanation of A.
Byssinosis is a recognized occupational respiratory disorder prevalent among workers in the cotton and textile industries. It is caused by the chronic inhalation of fine cotton dust, which leads to the narrowing of the airways. This physiological reaction results in symptoms like chest tightness and respiratory distress. The exposure to specific industrial dust directly explains why this disease occurs in these workers.

80. (D) Down syndrome - Trisomy 21
Congenital and genetic diseases are characterized by specific biological traits. Down syndrome is caused by trisomy 21, meaning the person has three copies of chromosome 21. Haemophilia is a clotting disorder, not a missing chromosome. Sickle cell anaemia is a genetic hemoglobin defect, not simple iron deficiency. Color blindness

Click Here to Buy book on Amazon

is usually an X-linked trait rather than being caused by extra chromosomes.

81. (A) I and II only
Dental health is influenced by both behavioral and biological factors. Dental caries occurs when acid-producing bacteria break down fermentable carbohydrates, leading to tooth decay. Oral cancer is strongly linked to tobacco use. Periodontal disease is an inflammatory condition that affects not only the teeth but also the supporting structures, including the gums and underlying bone, which can lead to tooth loss.

82. (B) A medical condition that is present at or before birth.
A congenital disease is any medical condition that is present from the time of birth, regardless of its cause. These conditions can result from genetic abnormalities, environmental factors during pregnancy, or infections passed from mother to child. They are distinct from diseases acquired later in life through lifestyle choices, occupational exposures, or infections from vectors after the birth process.

83. (A) P-III, Q-IV, R-I, S-II
Vectors and carriers play a critical role in the transmission of various infectious diseases. The Aedes aegypti mosquito transmits Chikungunya, while the common housefly can mechanically carry pathogens causing cholera. Ticks are the primary vectors for Lyme disease, and the Culex mosquito is responsible for spreading Japanese Encephalitis. Identifying these vectors is essential for implementing targeted pest control measures.

84. (A) Vitamin C
Scurvy is a nutritional deficiency disease that occurs when a person does not consume enough Vitamin C, also known as ascorbic acid. This vitamin is essential for the synthesis of collagen, which is a vital structural protein in the body. Historically common among sailors, the disease is characterized by swollen gums, bruising, and poor wound healing due to weakened connective tissues.

85. (A) I, II and IV only
Access to clean water and sanitation is a cornerstone of public health. It prevents the spread of enteric diseases like cholera and typhoid and reduces mosquito breeding sites by eliminating stagnant water. Boiling water is a simple and effective method to kill most waterborne pathogens. Safe water is a fundamental requirement for health in both rural and urban areas alike.

86. (A) Body Mass Index (BMI)
Body Mass Index is the standard diagnostic parameter used globally to classify individuals as underweight, normal weight, overweight, or obese. It is calculated by dividing a person's weight in kilograms by the square of their height in meters. While blood pressure and lipid profiles provide important health information, BMI specifically measures body fatness based on height and weight.

87. (C) A is true but R is false.
The World Health Organization is essential for managing global health crises like the COVID-19 pandemic by providing guidelines and coordinating international efforts. However, this does not mean that local health departments are powerless. In reality, state and local health departments possess significant authority and established mechanisms to implement vital disease control and public health measures within their own jurisdictions.

88. (B) A genetic condition affecting the structure of hemoglobin.
Sickle cell anaemia is an inherited blood disorder caused by a genetic mutation that affects the production and structure of hemoglobin. This leads to abnormally shaped red blood cells that can block blood flow. It is not an infectious disease, nor is it caused by vitamin deficiencies or bone deterioration. It is a chronic condition passed from parents to their biological offspring.

NODIA

89. (C) DPT - Dengue, Plague, Tetanus
Vaccines are specifically designed to protect against certain pathogens. BCG is used for tuberculosis and OPV for polio. The DPT vaccine, however, provides protection against Diphtheria, Pertussis (whooping cough), and Tetanus. It does not provide immunity against dengue or plague, which have different methods of prevention and control within the public health system and clinical practice.

these specific cultural and lifestyle habits directly explain the observed disease incidence.

108. (B) Restricting over-the-counter sales and promoting rational use.
India's National Action Plan on Antimicrobial Resistance focuses on controlling the misuse of antibiotics. Key interventions include restricting the over-the-counter sale of these drugs without a prescription and promoting their rational use by medical professionals. These measures aim to slow the development of drug-resistant bacteria by ensuring that antibiotics are used only when necessary and in the correct manner.

109. (B) Hepatitis B - Preventable by vaccination
Viral hepatitis consists of several types with different characteristics. Hepatitis B is a serious bloodborne infection that can lead to chronic liver disease, but it is effectively preventable through a widely available and safe vaccine. Hepatitis A and E are primarily waterborne, while Hepatitis C, although curable with medication, currently lacks a vaccine. Hepatitis A does not typically cause chronic cirrhosis.

110. (A) NCDs generally have longer duration and slower progression.
Communicable and non-communicable diseases differ in their clinical courses. NCDs, such as heart disease and diabetes, are typically chronic, meaning they have a long duration and progress slowly over time. Communicable diseases are often acute infections, although some can become chronic. Both types of diseases place a significant burden on health systems, and NCDs cannot be eradicated by vaccines alone.

111. (A) Inhalation of bacilli → Phagocytosis by alveolar macrophages → Granuloma formation → Caseous necrosis → Cavitation
The pathogenesis of tuberculosis begins with the inhalation of infectious droplets containing bacilli. Alveolar macrophages in the lungs phagocytize these bacteria, leading to the formation of a granuloma. As the disease progresses, caseous necrosis occurs within the granuloma. Eventually, this can lead to lung tissue cavitation, which allows the bacteria to spread more easily through coughing and respiratory contact with others.

112. (D) Reversible airway obstruction and episodes of bronchospasm.
Asthma is a chronic respiratory condition characterized by inflammation of the airways. A distinguishing feature is that the airway obstruction and episodes of bronchospasm are typically reversible, either spontaneously or with medical treatment. This is different from diseases like COPD, where lung damage is permanent, or infections where a constant pathogen is present, or conditions involving the irreversible stiffening of tissues.

113. (A) II, I, IV, III
Investigating an epidemic requires a systematic approach. The process begins by establishing that an outbreak actually exists. Next, the suspected diagnosis must be confirmed through clinical and laboratory methods. Health authorities then define and identify all potential cases to understand the scope of the problem. Finally, appropriate control and prevention measures are implemented to stop the spread of the disease.

114. (B) Typhoid
Waterborne diseases are caused by pathogens transmitted through contaminated water sources. Typhoid fever is a primary example, caused by the bacterium Salmonella typhi, which spreads through the ingestion of contaminated food or water. Dengue is vector-borne, tuberculosis is airborne, and ringworm is a fungal infection spread through direct contact. Understanding transmission modes is essential for implementing effective public health prevention.

115. (A) I, II, III and IV only
Ayushman Bharat PM-JAY is a major health assurance scheme in India. It provides extensive coverage for secondary and tertiary hospitalization expenses, including both pre- and post-hospitalization costs. The scheme identifies beneficiaries using the SECC database and has no restrictions on family size or age. While it is highly comprehensive, it is not limited only to providing basic primary healthcare services.

116. (A) Reducing dietary salt and engaging in regular aerobic exercise.
Managing hypertension effectively involves significant lifestyle modifications aimed at reducing the pressure within the arterial walls.

Downloaded from www.pdf.tube

to the environmental exposures individuals face during their professional activities.

99. (A) Both A and R are true and R is the correct explanation of A.
The National Diabetes Programme emphasizes lifestyle modifications because the majority of diabetes cases are Type 2. This type is strongly linked to modifiable factors such as poor diet, lack of physical exercise, and resulting obesity. By focusing on weight management and healthy habits, the program addresses the primary underlying causes of the disease, making lifestyle change an effective strategy.

100. (A) Haemophilia - Regular physical exercise
Preventive measures are tailored to the specific nature of each disease. Malaria is prevented with nets, cholera with clean water, and tuberculosis with the BCG vaccine. However, haemophilia is a genetic disorder caused by a lack of clotting factors. While general health is important, regular physical exercise cannot prevent this inherited condition or the bleeding episodes associated with it.

101. (A) I and II only
The National Immunisation Schedule includes vaccines that target critical childhood illnesses. The Rotavirus vaccine is essential for preventing severe diarrhoeal disease in infants. The pentavalent vaccine provides broad protection against five different diseases, including Hepatitis B and Haemophilus influenzae type b. Contrary to being exclusive to one group, tetanus toxoid is administered to both children and pregnant women.

102. (A) Absolute insulin deficiency resulting from autoimmune destruction.
Type 1 and Type 2 diabetes differ in their underlying causes. Type 1 is characterized by an absolute insulin deficiency because the body's immune system mistakenly destroys the insulin-producing cells in the pancreas. Type 2, which is more common in adults, involves the body becoming resistant to insulin or not producing enough of it, often linked to lifestyle and obesity.

103. (A) P-II, Q-I, R-IV, S-III
National and global health organizations have distinct primary roles. The World Health Organization is the leading international public health agency. The Indian Council of Medical Research is the apex body for biomedical research in India. The IDSP provides a national network for disease surveillance, and the National Health Mission is the primary scheme for delivering comprehensive healthcare services.

104. (B) Irreversible loss of renal function over months or years.
Chronic kidney disease is a progressive medical condition characterized by the gradual and irreversible loss of renal function over a long period. Unlike acute kidney issues that might be reversible, CKD involves permanent damage to the kidneys' ability to filter waste from the blood. This condition often stems from long-term complications of other diseases like diabetes and hypertension.

NODIA

105. (A) I, II and III only
HIV is transmitted through specific body fluids, including blood, semen, and breast milk. Common modes of spread include unprotected sexual contact, sharing contaminated needles, and transmission from an infected mother to her child during pregnancy or childbirth. It is a scientific fact that HIV is not transmitted through mosquito bites or casual contact like shaking hands or sharing food.

106. (D) Type 1 Diabetes
Autoimmune diseases occur when the body's immune system mistakenly attacks its own healthy cells. Type 1 diabetes is a classic example, as the immune system destroys insulin-producing cells in the pancreas. Malaria and rabies are infectious diseases caused by external pathogens, while asbestosis is an occupational disease resulting from the inhalation of industrial mineral fibers.

107. (A) Both A and R are true and R is the correct explanation of A.
Oral cancer has a high prevalence in several Indian states, primarily due to common behavioral practices. The widespread habit of chewing tobacco, betel nut, and gutka exposes the oral tissues to potent carcinogens over long periods. This chronic exposure significantly increases the risk of developing oral malignancies. Therefore,

90. (D) Byssinosis is caused by long-term exposure to loud noise.
Occupational diseases are linked to specific workplace exposures. Silicosis and asbestosis are caused by inhaling industrial dusts and increase lung cancer risks. Most are preventable with proper safety equipment. However, byssinosis is a respiratory condition caused by inhaling cotton or flax dust, not by exposure to loud noise. Noise exposure is typically associated with occupational hearing loss instead.

91. (A) Incubation → Prodromal → Illness → Decline → Convalescence
The course of an infectious disease follows a standard sequence of stages. It begins with the incubation period after exposure, followed by the prodromal phase with early symptoms. The illness stage is when symptoms are most severe, followed by the decline phase as the host recovers. Finally, the convalescence stage is the period of regaining strength and returning to health.

92. (B) Chronic Obstructive Pulmonary Disease (COPD)
Unmanaged diabetes mellitus can lead to various serious long-term complications due to chronic high blood sugar. These include neuropathy affecting the nerves, retinopathy damaging the eyes, and nephropathy impacting the kidneys. Chronic Obstructive Pulmonary Disease is a respiratory condition primarily caused by smoking and air pollution; it is not considered a direct clinical complication of the metabolic disorder diabetes.

93. (A) II, III, I
The Ayushman Bharat scheme organizes healthcare into a tiered system. It begins with Health and Wellness Centres at the community level for primary care. Primary Health Centres provide more specific services like maternal care. District Hospitals serve as the higher tier for advanced surgeries and specialized medical treatments. This hierarchy ensures that patients receive the appropriate level of care.

94. (A) Notifying the IDSP, isolating cases, and initiating investigation.
Upon detecting a cluster of unknown respiratory illness, immediate public health action is required. Notifying the Integrated Disease Surveillance Programme ensures that the event is tracked at a higher level. Isolating suspected cases prevents further transmission, while initiating an investigation helps identify the cause. These targeted steps are more effective than implementing nationwide lockdowns or prescribing antibiotics without a diagnosis.

95. (A) I, II, IV and V only
Depression and schizophrenia are significant mental health conditions that affect thinking and daily functioning. Public health efforts focus on reducing stigma and providing management through therapy and medication. While genetics can play a role, anxiety disorders are also heavily influenced by environmental factors and life experiences, rather than being purely determined by an individual's genetic makeup at birth.

96. (B) Deployment of the Rapid Response Team by the District Unit.
When rural health workers report a sudden spike in symptoms like fever and rash, it indicates a potential disease outbreak. The appropriate public health response is the deployment of a Rapid Response Team by the District Surveillance Unit. This team is trained to investigate the cause, confirm the diagnosis, and implement immediate control measures, ensuring the situation is managed effectively.

97. (A) P-III, Q-IV, R-I, S-II
Mental health disorders are identified by their characteristic clinical symptoms. Depression is marked by persistent low mood, while anxiety disorders involve chronic excessive worry. Schizophrenia is characterized by hallucinations and delusions. Bipolar disorder is defined by mood swings alternating between periods of mania and depression. Accurate symptom matching is essential for providing the correct psychological or psychiatric diagnosis and treatment.

98. (B) Occupational diseases
Silicosis and asbestosis are classic examples of occupational diseases. They are chronic lung conditions caused by the long-term inhalation of mineral dusts, specifically silica and asbestos, which typically occurs in industrial or mining workplaces. These conditions are not genetic, zoonotic, or vector-borne; they are directly related

Click Here to Buy book on Amazon

Reducing the intake of dietary salt helps lower fluid retention and blood volume. Additionally, regular aerobic exercise strengthens the heart muscle and improves overall vascular health. These non-pharmacological interventions are fundamental components of long-term cardiovascular health management and can prevent serious medical complications.

117. (A) P-IV, Q-III, R-I, S-II
Early warning signs of cancer are critical for timely diagnosis and treatment. A non-healing sore can indicate oral or skin carcinoma, while unusual discharge may suggest cervical or colorectal cancer. Thickening or a lump is a common sign of breast or testicular cancer. Obvious changes in a mole or wart are classic signs of skin cancer, such as melanoma.

118. (A) Viruses require host cells, whereas most bacteria multiply alone.
Bacteria and viruses are fundamental types of pathogens with distinct biological characteristics. Viruses are obligate intracellular parasites, meaning they must infect a host cell to replicate. In contrast, most bacteria are single-celled organisms that can multiply independently in various environments. Antibiotics are effective only against bacteria, not viruses, and neither type is always fatal or exclusively mild in nature.

119. (A) Both A and R are true and R is the correct explanation of A.
Dengue incidence typically peaks during the monsoon season because environmental factors favor the vector. Rainwater accumulates in various open containers and debris, creating numerous stagnant pools. These serve as ideal breeding grounds for Aedes mosquitoes, the primary transmitters of the dengue virus. The increase in the mosquito population directly leads to a higher rate of infection within the human population.

120. (B) Hepatic failure - Vitamin A deficiency
Liver diseases result from various causes. Alcoholic cirrhosis is linked to heavy drinking, while non-alcoholic fatty liver is associated with obesity and metabolic issues. Hepatitis B is a viral infection targeting the liver. However, hepatic failure is a severe loss of liver function caused by acute or chronic damage, rather than being a direct consequence of Vitamin A deficiency.

121. (A) I and II only
Fungal diseases affect various parts of the body. Ringworm is a common skin infection caused by dermatophytes, while candidiasis typically involves the mucous membranes of the mouth or reproductive organs. Unlike these, aspergillosis is a fungal infection that primarily targets the respiratory system, especially in individuals with underlying lung conditions or weakened immune systems, rather than the nervous system.

122. (D) An epidemic occurring globally or over a very wide area.
A pandemic is defined as an outbreak of a disease that occurs over a wide geographic area and typically affects an exceptionally high proportion of the population. It is essentially an epidemic that has spread globally or across multiple countries and continents. This is distinct from an endemic disease, which is habitually present, or a localized spike in a single community.

123. (A) P-III, Q-II, R-I, S-IV
Genetic and congenital diseases result from specific biological mechanisms. Down syndrome is caused by the trisomy of chromosome 21. Haemophilia is an X-linked recessive bleeding disorder. Sickle cell anaemia results from a point mutation that changes the structure of hemoglobin. Cystic fibrosis is caused by defective chloride channel transport. Understanding these mechanisms is essential for the diagnosis and management of these conditions.

124. (B) Trypanosoma brucei
Sleeping sickness, also known as African trypanosomiasis, is caused by the protozoan parasite Trypanosoma brucei, which is transmitted to humans by the bite of the tsetse fly. While Plasmodium falciparum causes malaria and Leishmania donovani leads to kala-azar, Entamoeba histolytica is responsible for amoebic dysentery. Each of these protozoan pathogens targets different systems and requires specific medical treatments for recovery.

125. (A) I, II and IV only
The DOTS strategy is the internationally recommended approach for tuberculosis control.

Downloaded from www.pdf.tube

7. Match the satellite orbits in List I with their characteristic altitudes or applications in List II:
List I: (Satellite Orbit)
P. Low Earth Orbit (LEO)
Q. Medium Earth Orbit (MEO)
R. Geostationary Orbit (GEO)
S. Sun-synchronous Orbit
List II: (Characteristic/Application)
I. Navigation satellites (e.g., GPS)
II. Telecommunication satellites
III. Earth observation at consistent solar illumination
IV. International Space Station altitude
(A) P-IV, Q-I, R-II, S-III
(B) P-I, Q-IV, R-III, S-II
(C) P-IV, Q-II, R-I, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

8. Which of the following statements correctly describes the defining feature of the LVM3 (Launch Vehicle Mark-3)?
(A) It utilizes an exclusively solid propellant configuration for all primary launch stages.
(B) It was engineered specifically for placing nano-satellites into standardized low earth orbits.
(C) It operates as a fully reusable spaceplane platform modeled after the international space shuttle.
(D) It is a three-stage vehicle featuring an indigenous cryogenic upper propulsion system.
(E) Answer not known

9. Consider the following statements regarding the NavIC system:
I. NavIC is the operational name for the Indian Regional Navigation Satellite System (IRNSS).
II. It consists of a constellation of 7 satellites.
III. It provides coverage strictly within the geographical boundaries of India.
IV. Three satellites are placed in geostationary orbit.
V. It provides standard positioning service for civilian use and restricted service for strategic users.
Which of the above statements are incorrect?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, II and V
(D) I, IV and V
(E) Answer not known

10. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The Chandrayaan-1 mission was pivotal in the discovery of water molecules on the lunar surface.
Reason (R): The Moon Mineralogy Mapper (M3) payload aboard Chandrayaan-1 confirmed the presence of solid ice at the lunar poles.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

11. Select the correct sequence representing the chronological evolution of India's satellite launch vehicles.
(A) ASLV, SLV-3, PSLV, GSLV, LVM3
(B) SLV-3, ASLV, PSLV, GSLV, LVM3
(C) SLV-3, PSLV, ASLV, LVM3, GSLV
(D) ASLV, PSLV, SLV-3, LVM3, GSLV
(E) Answer not known

12. Which of the following statements about the Aditya-L1 mission is incorrect?
(A) The mission is designed to land a rover on the solar surface.
(B) It is India's first dedicated scientific mission to study the Sun.
(C) It is placed in a halo orbit around the Lagrange point 1 (L1) of the Sun-Earth system.
(D) The Visible Emission Line Coronagraph (VELC) is its primary payload.
(E) Answer not known

13. Match the Indian satellite series in List I with their primary applications in List II:
List I: (Satellite Series)
P. INSAT
Q. IRS
R. Cartosat

NODIA

134. (A) Ascariasis
Helminthic diseases are caused by parasitic worms that can infect the human body. Ascariasis is a common example, caused by the intestinal roundworm Ascaris lumbricoides. Ringworm is a fungal infection, while kala-azar and amoebic dysentery are caused by protozoan parasites. Identifying the biological nature of the pathogen is essential for selecting the appropriate antiparasitic, antifungal, or antibacterial medical treatment for patients.

135. (A) I, II, III and IV only
Cancer treatment typically involves a combination of surgery, chemotherapy, radiation therapy, and immunotherapy, each targeting the disease in different ways. While these therapies aim to cure or manage the cancer, palliative care has a different primary goal. Palliative care focuses on improving the quality of life and relieving symptoms for patients with serious illnesses, rather than aiming to provide a complete cure.

136. (B) Tobacco control and reducing indoor and outdoor air pollution.
Reducing the global burden of chronic respiratory diseases like COPD requires addressing the primary environmental and behavioral risks. Tobacco control is the most critical intervention, as smoking is a leading cause of lung damage. Additionally, reducing both indoor and outdoor air pollution helps protect lung health across the population. These preventive strategies are far more effective than nutritional or antimalarial interventions.

137. (A) P-II, Q-I, R-III, S-IV
Vaccines and preventive measures are specifically matched to each infectious disease. Rabies is managed through post-exposure prophylaxis, while tuberculosis is prevented by the BCG vaccine. Polio is addressed using oral or inactivated vaccines. COVID-19 prevention has utilized advanced vaccine technologies, including mRNA and viral vector platforms. These specific interventions are fundamental components of national and global immunization strategies.

138. (D) Transmits a pathogen between hosts without being affected.
In the context of infectious diseases, a vector is a living organism that carries and transmits an infectious pathogen from one host to another. Common vectors include mosquitoes, ticks, and flies. Crucially, the vector itself typically does not suffer from the disease it carries. This biological role makes vectors a critical link in the transmission cycle for many serious global health conditions.

139. (A) Both A and R are true and R is the correct explanation of A.
The Integrated Health Information Platform significantly enhances disease surveillance in India by leveraging modern technology. It allows for the real-time entry of case-based data and uses geotagging to pinpoint the exact location of disease outbreaks. This digital approach provides health authorities with immediate information, enabling a much faster and more accurate response than traditional paper-based reporting systems allowed previously.

140. (B) Nipah - Coronavirus
Zoonotic diseases are caused by specific pathogens transmitted from animals to humans. Swine flu is caused by the H1N1 virus, and bird flu by the H5N1 virus. COVID-19 is caused by the SARS-CoV-2 coronavirus. However, the Nipah virus is not a coronavirus; it belongs to a different family of viruses. Accurate identification of these viral families is essential for scientific research.

141. (C) I, II and III
Blindness and visual impairment in India are caused by various medical conditions. Cataract is the leading cause of reversible blindness, while glaucoma involves progressive damage to the optic nerve. Nutritional factors are also critical, as Vitamin A deficiency in children can lead to xerophthalmia and permanent loss of sight. Addressing these diverse causes is a major priority for national eye health programs.

142. (A) Occupational disease
Byssinosis is a chronic respiratory condition categorized as an occupational disease because it results from environmental exposures in the workplace. It is specifically caused by the inhalation of dust from cotton, flax, or hemp, most commonly affecting workers in the textile industry. It is not an infectious waterborne, genetic, or zoonotic disease, as its primary cause is related to specific industrial activities.

Click Here to Buy book on Amazon

160. (D) Direct contact - Ringworm

Infectious diseases utilize different modes of transmission to spread between hosts. Ringworm is a common fungal skin infection primarily transmitted through direct skin-to-skin contact with an infected person or animal. In contrast, cholera is waterborne rather than airborne, and malaria is vector-borne rather than spread by droplets. Rabies is typically transmitted through animal bites rather than by insects, which are biological vectors.

www.nodia.in

NODIA

kill any remaining pathogenic microorganisms, making the water safe for consumption by the general public.

152. (B) Type 2 Diabetes
Type 2 diabetes is a chronic metabolic disorder strongly associated with specific modifiable risk factors. A population with a high intake of dietary sugar, low levels of physical activity, and increasing insulin resistance is at a significantly higher risk for developing this condition. Unlike Type 1 diabetes, which is an autoimmune disorder, Type 2 is largely driven by these environmental and behavioral factors.

153. (A) II, IV, I, III
Chronic alcohol consumption leads to a progressive decline in liver health. It often starts with the accumulation of fat in liver cells, known as steatosis. This can progress to alcoholic hepatitis, which involves inflammation and damage. Over time, this results in cirrhosis, characterized by permanent scarring of the liver tissue. Ultimately, this progression can lead to total hepatic failure, which is life-threatening.

154. (D) Delivering comprehensive primary care closer to the community.
The establishment of Health and Wellness Centres under the Ayushman Bharat scheme is designed to strengthen the foundation of India's healthcare system. These centres aim to deliver a wide range of comprehensive primary care services, including maternal and child health and management of non-communicable diseases, directly within local communities. This approach improves accessibility and ensures that health issues are addressed.

155. (A) I, II, III and V only
The World Health Organization plays a critical role in global health by monitoring trends, setting diagnostic standards, and providing technical support to countries. It also works on building the capacity of the global health workforce. While it coordinates international efforts, it does not conduct field trials within a country without the consent of the national government or manage sovereign health budgets.

156. (B) Tuberculosis
Chronic symptoms such as significant weight loss, night sweats, and a persistent cough that produces blood-tinged sputum are strong clinical indicators of tuberculosis. These features are characteristic of a chronic respiratory infection rather than acute conditions like cholera or hepatitis. Recognizing these signs is essential for health professionals to prioritize testing for the bacterium Mycobacterium tuberculosis to begin appropriate medical management.

157. (A) P-IV, Q-II, R-III, S-I
Addressing mental health requires a multi-faceted approach. Destigmatization focuses on increasing societal awareness and acceptance of mental illness. Rehabilitation aims to help patients reintegrate into society and lead productive lives. Counseling provides psychological support and therapy, while pharmacotherapy involves the use of psychiatric medications to manage symptoms. These components work together to provide comprehensive care for individuals with mental disorders.

158. (A) Faster detection of disease clusters based on symptoms alone.
Syndromic surveillance is a key part of the Integrated Disease Surveillance Programme that allows health workers to report clusters of illness based on common symptoms before a laboratory diagnosis is confirmed. This approach enables the much faster detection of potential outbreaks, allowing for a more rapid public health response. It complements laboratory-based surveillance by providing early warning signals in the field.

159. (A) Both A and R are true and R is the correct explanation of A.
Routine childhood immunization is considered one of the most cost-effective public health interventions available. By providing early protection against various pathogens, vaccines significantly prevent illness, death, and the long-term disabilities that can result from vaccine-preventable diseases. The significant reduction in the social and economic burden of these diseases directly justifies the investment in comprehensive immunization programs for children.

Downloaded from www.pdf.tube

143. (A) P-IV, Q-II, R-I, S-III
Many infectious diseases present with characteristic clinical signs that aid in their diagnosis. Hydrophobia, or the fear of water, is a classic symptom of rabies. The swelling of lymph nodes, known as buboes, is a hallmark of the bubonic plague. Severe joint pain is characteristic of chikungunya, and jaundice, or yellowing of the skin, is a common sign of hepatitis.

144. (D) Tuberculosis
Prolonged cough, night sweats, and weight loss are classic clinical symptoms of tuberculosis. These signs, combined with a positive result in sputum microscopy, which detects the presence of Mycobacterium tuberculosis bacilli, strongly indicate that the patient is suffering from this bacterial respiratory infection. Early diagnosis through these standard methods is essential for initiating the appropriate long-term antibiotic treatment and preventing spread.

145. (A) I, II and III only
Effective malaria control involves a combination of vector management and medical treatment. Indoor residual spraying and the use of insecticidal nets provide protection by reducing mosquito populations and preventing bites. Artemisinin-based combination therapies are the standard treatment for malaria caused by P. falciparum. However, because malaria is transmitted by mosquitoes and not through ingestion, drinking boiled water does not prevent it.

146. (B) Reduces out-of-pocket spending for catastrophic health events.
A major advantage of the Ayushman Bharat PM-JAY scheme is that it provides significant financial protection for poor and vulnerable families. By covering the costs of secondary and tertiary care hospitalization, the scheme helps reduce the high out-of-pocket spending that often occurs during catastrophic health events. This financial safety net prevents families from falling into poverty due to expensive medical bills.

147. (A) Both A and R are true and R is the correct explanation of A.
The global eradication of smallpox is a major public health achievement made possible by an intensive vaccination campaign. The biological characteristics of the virus were key factors; it only infected humans and had no animal reservoir, meaning there was no source for re-infection. Additionally, the vaccine was highly effective and provided long-lasting immunity, allowing the virus to be eliminated worldwide.

148. (A) Standard antibiotics are becoming ineffective against bacteria.
A rapid rise in antimicrobial resistance within a healthcare setting signifies that common bacterial pathogens are evolving to survive treatment. This means that standard antibiotics that were once effective are no longer able to kill or inhibit the growth of these bacteria. This situation makes infections more difficult to treat, leading to longer hospital stays, higher costs, and increased mortality rates.

149. (C) Active immunity is produced by one's own body in response to a specific antigen.
Immunity is the body's ability to defend itself against pathogens. Active immunity occurs when the individual's own immune system produces antibodies and memory cells in response to an infection or a vaccine. This provides long-lasting protection. In contrast, innate immunity is present from birth, and passive immunity involves receiving antibodies from an external source, providing only temporary protection without immunological memory.

NODIA

150. (A) Can cause disease in individuals with weak immune systems.
Live attenuated vaccines use a weakened form of the germ that causes a disease. While they stimulate a strong and long-lasting immune response, a key disadvantage is that the weakened pathogen can potentially cause disease in people with severely compromised immune systems. Inactivated vaccines use a killed version of the germ and are generally safer for these individuals, although they require boosters.

151. (B) Coagulation → Sedimentation → Filtration → Disinfection
Municipal water purification follows a logical sequence to ensure safety. Coagulation involves adding chemicals to clump particles together, followed by sedimentation where these clumps settle. Filtration then removes the remaining fine particles and impurities from the water. Finally, disinfection, often using chlorine, is performed to

CHAPTER 11

Space Science and Defence Technology

1. Which of the following best defines the primary scope of space science in the context of national development?
(A) The exclusive study of extraterrestrial life and deep space anomalies
(B) The restriction of aerospace engineering to military applications and espionage
(C) The study of lunar geology strictly for establishing commercial mining operations
(D) The application of orbital technologies for earth observation, communication, and socio-economic growth
(E) Answer not known

2. Consider the following statements regarding the milestones in space exploration:
I. Sputnik 1 was the first artificial Earth satellite launched by the Soviet Union.
II. Apollo 11 was the first crewed mission to land on the Moon.
III. India's first satellite Aryabhata was launched using an indigenous SLV.
Which of the above statements are correct?
(A) I and II
(B) I and III
(C) II only
(D) III only
(E) Answer not known

3. In which year was the Indian Space Research Organisation (ISRO) formally established, superseding the Indian National Committee for Space Research (INCOSPAR)?
(A) 1962
(B) 1969
(C) 1975
(D) 1980
(E) Answer not known

4. Consider the following statements regarding the organisational structure and objectives of ISRO:
I. ISRO reports directly to the Prime Minister through the Department of Space.
II. The Vikram Sarabhai Space Centre (VSSC) is responsible for building launch vehicles.
III. The ISRO Propulsion Complex (IPRC) is located in Mahendragiri, Tamil Nadu.
IV. Antrix Corporation is the newly formed regulatory body for private space players.
Which of the above statements are correct?
(A) I, II and III
(B) II, III and IV
(C) I and IV
(D) II and IV
(E) Answer not known

5. Which of the following launch vehicles successfully placed the Rohini satellite RS-1 into orbit in 1980, marking India's entry into the exclusive club of space-faring nations?
(A) SLV-3
(B) ASLV
(C) PSLV
(D) GSLV
(E) Answer not known

6. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The Polar Satellite Launch Vehicle (PSLV) is known as the workhorse of ISRO.
Reason (R): It has a highly reliable track record and successfully launched missions like Chandrayaan-1 and Mangalyaan.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

Click Here to Buy book on Amazon

It involves the direct observation of patients taking their medicine to ensure full adherence to the short-course treatment regimen. Sputum smear microscopy is a fundamental diagnostic tool used within this framework. While vital for TB, DOTS is not the specific strategy used for treating HIV/AIDS or other infections.

126. (A) Aspergillosis
Fungal diseases are caused by various types of fungi that can infect the skin, lungs, or other organs. Aspergillosis is a primary example of a fungal infection that typically affects the respiratory system. In contrast, ascariasis and filariasis are caused by parasitic helminth worms, and amoebic dysentery is a condition resulting from an infection by a protozoan parasite, Entamoeba histolytica.

127. (A) Both A and R are true and R is the correct explanation of A.
Type 2 diabetes is frequently referred to as a lifestyle disease because its development is closely tied to behavioral factors. Sedentary habits and poor dietary choices lead to obesity, which significantly increases the risk of the body becoming resistant to insulin. Because these personal choices and habits are primary drivers of the disease, the term lifestyle disease is medically and scientifically accurate.

128. (D) Implementing infection control and antibiotic stewardship.
Controlling antimicrobial resistance requires a comprehensive approach that includes preventing infections and ensuring the appropriate use of medicines. Implementing strict infection control practices in healthcare settings and adopting antibiotic stewardship programs helps ensure that antibiotics are used only when necessary and correctly. This reduces the selective pressure that allows resistant bacteria to thrive and spread, protecting the effectiveness of existing treatments.

129. (C) NPCB - Control of Blindness
India has several national health programmes targeting specific health issues. The National Programme for Control of Blindness focuses on reducing visual impairment and blindness. In contrast, the NACP targets HIV/AIDS control, the IDSP manages national disease surveillance, and PM-JAY provides financial protection for secondary and tertiary healthcare rather than specifically focusing on malaria control as its primary stated objective.

130. (B) Hepatitis A is usually acute while C often becomes chronic.
Hepatitis A and C are both viral infections affecting the liver but differ in their clinical progression and transmission. Hepatitis A is typically an acute, short-term illness that is often spread through contaminated food or water. Hepatitis C is primarily bloodborne and frequently leads to chronic, long-term infection and liver damage. While both are serious, their typical disease courses are quite distinct.

131. (A) Egg → Larva → Pupa → Adult
The life cycle of the mosquito vector, including Aedes and Anopheles species, involves four distinct stages. It begins with the egg, which is laid in or near water. The egg hatches into a larva, which then develops into a pupa. Finally, the adult mosquito emerges from the pupal stage. Understanding this cycle is vital for implementing effective mosquito control measures.

132. (A) Rice-water stools accompanied by severe dehydration levels.
Cholera is an acute diarrhoeal disease caused by the ingestion of food or water contaminated with the bacterium Vibrio cholerae. A prominent and characteristic clinical feature is the production of large volumes of watery stools, often resembling rice water. This rapid loss of fluids and electrolytes can lead to severe dehydration and requires immediate and intensive rehydration therapy for survival.

133. (A) II, I, III, IV
Managing a diabetic patient under a national health program follows a structured clinical pathway. The process typically begins with screening to identify high blood sugar levels. Once diagnosed, patients receive counseling on lifestyle modifications like diet and exercise. If lifestyle changes are insufficient, oral hypoglycemic medications are initiated. Finally, the focus includes monitoring and managing any long-term complications that may develop.

NODIA

S. GSAT
List II: (Primary Application)
I. High-resolution mapping
II. Telecommunications and broadcasting
III. Resource monitoring and agriculture
IV. Advanced communication networks
(A) P-II, Q-III, R-I, S-IV
(B) P-III, Q-I, R-IV, S-II
(C) P-II, Q-I, R-III, S-IV
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

14. Which of the following pairs concerning India's defence missiles is correctly matched?
(A) Agni-V - Short-range tactical ballistic missile
(B) BrahMos - Supersonic cruise missile
(C) Prithvi - Air-to-air missile
(D) Akash - Anti-tank guided missile
(E) Answer not known

15. Arrange the following Agni missile series in ascending order of their operational range:
I. Agni-V
II. Agni-I
III. Agni-III
IV. Agni-II
(A) II, IV, III, I
(B) I, III, IV, II
(C) II, III, IV, I
(D) IV, II, III, I
(E) Answer not known

16. All of the following are primary applications of remote sensing satellites, EXCEPT:
(A) Precision agricultural crop yield estimation
(B) Detailed national forest cover density mapping
(C) Dedicated deep space planetary exploration missions
(D) Systematic groundwater prospect mapping and analysis
(E) Answer not known

17. Which of the following pairs of Indian Space Project Directors and their native districts in Tamil Nadu is correctly matched?
(A) K. Sivan - Chennai
(B) P. Veeramuthuvel - Madurai
(C) Nigar Shaji - Tirunelveli
(D) Mylswamy Annadurai - Coimbatore
(E) Answer not known

18. Which of the following is the most appropriate reason for establishing a new spaceport at Kulasekarapattinam in Tamil Nadu?
(A) To facilitate the launch of high-mass heavy satellites using LVM3 platforms.
(B) To function as the primary command center for all Gaganyaan crewed missions.
(C) To offer a direct southern launch trajectory for SSLVs without maneuvering around Sri Lanka.
(D) To entirely replace the Satish Dhawan Space Centre due to severe coastal erosion.
(E) Answer not known

19. If a disaster management agency needs continuous real-time weather monitoring over the Indian subcontinent, which satellite orbit would be conceptually applied for deploying the satellite?
(A) Low Earth Orbit
(B) Geostationary Orbit
(C) Sun-synchronous Orbit
(D) Medium Earth Orbit
(E) Answer not known

NODIA

20. Under which classification does the Rustom developed by the Defence Research and Development Organisation (DRDO) fall?
(A) Intercontinental Ballistic Missile
(B) Nuclear-powered attack submarine
(C) Airborne Early Warning and Control System
(D) Unmanned Aerial Vehicle (UAV)
(E) Answer not known

21. Which of the following provides the most accurate definition of a "cryogenic engine"?
(A) An engine using liquid oxygen and hydrogen at extremely low temperatures.
(B) An engine using heavily compressed solid chemical fuels at room temperature.
(C) An engine designed to utilize atmospheric oxygen during high-altitude flight.
(D) An engine utilizing controlled nuclear fission for deep space propulsion.
(E) Answer not known

22. Consider the following statements regarding the Mars Orbiter Mission (Mangalyaan):
I. It made India the first Asian nation to reach Martian orbit.
II. It was launched using the GSLV Mk III

launch vehicle.
III. It succeeded in its very first attempt, a global record.
Which of the above statements is incorrect?
(A) I and II
(B) I and III
(C) II only
(D) III only
(E) Answer not known

23. The Combat Vehicles Research and Development Establishment (CVRDE), a premier laboratory of DRDO responsible for the development of the Arjun Main Battle Tank, is located in:
(A) Avadi, Tamil Nadu
(B) Bengaluru
(C) Hyderabad
(D) Pune
(E) Answer not known

24. Consider the following statements about the Chandrayaan-3 mission:
I. The lander module was named Vikram and the rover was named Pragyan.
II. It successfully demonstrated a soft landing near the lunar South Pole.
III. The touchdown spot of the Vikram lander was named 'Tiranga Point'.
IV. The mission confirmed the presence of Sulphur on the lunar surface.
Which of the above statements is incorrect?
(A) I, II and IV
(B) II, III and IV
(C) I and III
(D) III only
(E) Answer not known

25. What is the primary role of IN-SPACe (Indian National Space Promotion and Authorization Centre)?
(A) To construct indigenous heavy-lift launch vehicles for ISRO missions.
(B) To act as a single-window nodal agency for authorizing private space activities.
(C) To manage the telemetry and daily operations of the NavIC satellite system.
(D) To serve as the strategic military command for national anti-satellite strikes.
(E) Answer not known

26. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The development of the Tejas Light Combat Aircraft (LCA) significantly boosted India's indigenous aerospace capabilities.
Reason (R): Tejas is a heavy-weight, twin-engine stealth fighter designed exclusively for aircraft carriers.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

27. Match the DRDO missile programs in List I with their specific battlefield roles in List II:
List I: (Missile Program)
P. Agni
Q. Prithvi
R. Akash
S. Nag
List II: (Battlefield Role)
I. Surface-to-Air Missile
II. Anti-Tank Guided Missile
III. Short-range Surface-to-Surface Missile
IV. Intermediate/Intercontinental Ballistic Missile
(A) P-IV, Q-III, R-I, S-II
(B) P-III, Q-IV, R-II, S-I
(C) P-IV, Q-I, R-III, S-II
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

28. Which of the following statements correctly identifies the objective of India's Gaganyaan mission?
(A) To demonstrate human spaceflight capability in a 400 km low Earth orbit.
(B) To land an indigenous autonomous rover on the planetary surface of Mars.
(C) To establish a permanent Indian space station at the solar Lagrange Point 1.
(D) To intercept and safely remove hazardous orbiting space debris from orbit.
(E) Answer not known

Downloaded from www.pdf.tube

29. Consider the following statements regarding India's defence exports and manufacturing:
I. The 'Make in India' initiative emphasizes the indigenization of defence production.
II. India recently exported the BrahMos missile system to the Philippines.
III. Tamil Nadu hosts one of the two Defence Industrial Corridors in India.
IV. India has surpassed the United States to become the largest arms exporter globally.
V. The LCA Tejas is being actively pitched for export to foreign nations.
Which of the above statements is incorrect?
(A) I, II, III and V
(B) I, III and IV
(C) II, IV and V
(D) IV only
(E) Answer not known

30. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): Mission Shakti conducted in 2019 was a significant milestone for India's strategic deterrence.
Reason (R): It successfully demonstrated India's Anti-Satellite (ASAT) technology by destroying a live satellite in Low Earth Orbit.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

31. Select the correct sequence of India's nuclear triad delivery platforms spanning land, air, and sea respectively.
(A) Agni-V, Mirage-2000, INS Arihant
(B) INS Arihant, Agni-V, Mirage-2000
(C) Mirage-2000, INS Arihant, Agni-V
(D) Agni-V, INS Arihant, Mirage-2000
(E) Answer not known

32. Which of the following statements regarding the Indian National Space Promotion and Authorization Centre (IN-SPACe) is incorrect?
(A) It facilitates the participation of private sector companies in space activities.
(B) It functions as an autonomous agency in the Department of Space.
(C) It has the authority to oversee commercial operations of foreign agencies exclusively.
(D) It works alongside NewSpace India Limited (NSIL) to commercialize space technology.
(E) Answer not known

33. Match the space organizations or institutions in List I with their headquarters or locations in List II:
List I: (Organization/Institution)
P. ISRO Headquarters
Q. Vikram Sarabhai Space Centre (VSSC)
R. Satish Dhawan Space Centre (SDSC)
S. ISRO Propulsion Complex (IPRC)
List II: (Headquarters/Location)
I. Sriharikota
II. Bengaluru
III. Mahendragiri
IV. Thiruvananthapuram
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-III, S-I
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

34. Which of the following pairs of Indian defence equipment and their type is incorrectly matched?
(A) INS Vikrant - Aircraft Carrier
(B) Pinaka - Multi-Barrel Rocket Launcher
(C) Kaveri - Main Battle Tank
(D) Netra - Airborne Early Warning and Control System
(E) Answer not known

35. Arrange the following space milestones of India in chronological order:
I. Launch of Mangalyaan
II. Launch of Aryabhata
III. First successful flight of PSLV
IV. Chandrayaan-1 mission
(A) II, III, IV, I
(B) II, IV, III, I
(C) III, II, I, IV
(D) II, III, I, IV
(E) Answer not known

NODIA

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

51. Select the correct sequence of layers in the Earth's atmosphere, starting from the surface, which space vehicles must traverse during launch.
(A) Stratosphere, Troposphere, Mesosphere, Thermosphere, Exosphere
(B) Troposphere, Stratosphere, Mesosphere, Thermosphere, Exosphere
(C) Troposphere, Mesosphere, Stratosphere, Exosphere, Thermosphere
(D) Thermosphere, Stratosphere, Troposphere, Mesosphere, Exosphere
(E) Answer not known

52. Which of the following statements regarding the integration of Artificial Intelligence (AI) in defence is incorrect?
(A) AI is utilized for predictive maintenance of military aircraft.
(B) AI enhances border surveillance through autonomous drones.
(C) AI algorithms are used in threat perception and data analysis.
(D) AI guarantees the complete removal of human casualties in all combat scenarios.
(E) Answer not known

53. Match the Indian lunar and planetary missions with their significant scientific findings or primary objectives:
List I: (Space Mission)
P. Chandrayaan-1
Q. Mangalyaan (MOM)
R. Chandrayaan-3
S. Aditya-L1
List II: (Finding/Objective)
I. Soft landing near the lunar South Pole
II. Observation of solar corona and solar winds
III. Discovery of hydroxyl and water molecules on the Moon
IV. Demonstration of orbital insertion technology around Mars
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-I, Q-II, R-III, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

54. Which of the following pairs concerning ISRO launch vehicles is correctly matched?
(A) SLV-3 - Carries a payload of up to 4000 kg to Geosynchronous Transfer Orbit
(B) LVM3 - primarily designed for low-budget nano-satellite launches
(C) PSLV - primarily used for launching Earth Observation satellites into Polar orbits
(D) ASLV - Uses a fully cryogenic propulsion system
(E) Answer not known

55. Arrange the following defense aircraft/UAVs based on their indigenous development timeline from earliest to latest conceptualization/ induction:
I. HF-24 Marut
II. LCA Tejas
III. Rustom UAV
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) I, III, II
(E) Answer not known

56. All of the following are practical everyday life applications of space technology, EXCEPT:
(A) Direct-to-Home (DTH) television broadcasting
(B) Turn-by-turn GPS navigation in smartphones
(C) Early warning systems for tropical cyclones
(D) Deep ocean floor mineral extraction
(E) Answer not known

57. Which of the following pairs related to India's defence installations in Tamil Nadu is incorrectly matched?
(A) Heavy Vehicles Factory (HVF) - Avadi
(B) Naval Base INS Kadamba - Chennai
(C) Ordnance Factory - Tiruchirappalli
(D) Defence Services Staff College - Wellington
(E) Answer not known

Click Here to Buy book on Amazon

III. All the launched satellites belonged exclusively to the Indian government.
IV. It demonstrated ISRO's capability in the global commercial rideshare market.
Which of the above statements are correct?
(A) I, II and IV
(B) II, III and IV
(C) I and III
(D) I and IV
(E) Answer not known

45. Which eminent space scientist from Tamil Nadu served as the Project Director for India's first lunar mission, Chandrayaan-1?
(A) Dr. K. Radhakrishnan
(B) Dr. Mylswamy Annadurai
(C) Dr. A. P. J. Abdul Kalam
(D) Dr. G. Madhavan Nair
(E) Answer not known

46. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The PSLV rideshare capability has fueled a small satellite revolution globally.
Reason (R): It offers cost-effective and reliable launch options for international academic institutions and private start-ups.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

47. Match the ISRO centers with their core functional areas:
List I: (ISRO Center)
P. U R Rao Satellite Centre (URSC)
Q. Space Applications Centre (SAC)
R. Master Control Facility (MCF)
S. Liquid Propulsion Systems Centre (LPSC)
List II: (Functional Area)
I. Design and development of satellites
II. Development of payloads and societal applications
III. Monitoring and control of geostationary satellites
IV. Development of liquid and cryogenic engines
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

48. Which of the following statements correctly highlights the significance of the Shiv Shakti Point?
(A) It is the location where India's first nuclear test was conducted.
(B) It is the highest peak in the Western Ghats discovered via remote sensing.
(C) It is the lunar landing site of the Chandrayaan-3 Vikram lander.
(D) It is the designated launch pad for the Gaganyaan mission.
(E) Answer not known

49. Consider the following statements about India's defence mechanisms:
I. DRDO was established in 1958 to build indigenous defence technologies.
II. The Agni-V is an Intercontinental Ballistic Missile with a range exceeding 5000 km.
III. The Integrated Guided Missile Development Programme (IGMDP) was spearheaded by Dr. A.P.J. Abdul Kalam.
IV. India has a strict 'First Use' nuclear doctrine.
V. The nuclear triad consists of land, sea, and air-based delivery systems.
Which of the above statements is incorrect?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, III and V
(D) IV only
(E) Answer not known

50. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The commercialization of the space sector through NewSpace India Limited (NSIL) is vital for India's economic growth.
Reason (R): It allows ISRO to completely shut down its research operations and function solely as a profit-making corporate entity.

NODIA

(E) Answer not known

66. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The inclusion of INS Arihant in the Indian Navy completed India's nuclear triad.
Reason (R): INS Arihant is a nuclear-powered ballistic missile submarine capable of launching SLBMs.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

67. Match the Lagrange Points with their conceptual significance in space science:
List I: (Lagrange Point)
P. L1
Q. L2
R. L3
S. L4 & L5
List II: (Significance)
I. Home to the James Webb Space Telescope, always facing away from the Sun
II. Uninterrupted view of the Sun; location of Aditya-L1
III. Stable points hosting Trojan asteroids
IV. Hidden behind the Sun; rarely used for space missions
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-III, R-I, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

68. Which of the following statements correctly describes the Small Satellite Launch Vehicle (SSLV) developed by ISRO?
(A) It takes several months to assemble and requires a massive launch infrastructure.
(B) It is entirely powered by cryogenic engines for deep space missions.
(C) It was designed specifically to replace the LVM3 for crewed missions.
(D) A three-stage solid vehicle for launching 500 kg satellites into LEO.
(E) Answer not known

69. Consider the following statements regarding space debris mitigation measures:
I. The Inter-Agency Space Debris Coordination Committee (IADC) issues guidelines for debris mitigation.
II. ISRO has set up the ISRO System for Safe and Sustainable Space Operations Management (IS4OM).
III. Project NETRA is an Indian initiative to monitor space debris.
IV. Satellites in LEO are generally required to de-orbit within 25 years after their mission life.
V. Global laws mandate the immediate destruction of defunct satellites using ASAT missiles.
Which of the above statements is incorrect?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) V only
(E) Answer not known

70. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The Polar Satellite Launch Vehicle (PSLV) uses solid and liquid stages alternately.
Reason (R): This configuration provides a balance of high thrust from solid stages and precise control from liquid stages.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

71. Select the correct sequence of ISRO's navigation satellite systems and services from basic to advanced localized coverage.
(A) GAGAN, NavIC
(B) NavIC, GAGAN
(C) INSAT, IRS

Downloaded from www.pdf.tube

58. Which of the following is the most appropriate reason for placing the Aditya-L1 spacecraft at the Lagrange Point 1 (L1)?
(A) It allows the spacecraft to land safely on the solar surface.
(B) It is the only point in space where solar radiation is entirely neutralized.
(C) It provides a continuous view of the Sun without occultation or eclipses.
(D) It allows the spacecraft to refuel using the Earth's magnetic field.
(E) Answer not known

59. In the context of satellite-based disaster management, which conceptual approach allows authorities to effectively track cyclone paths and map flooded regions?
(A) Synthesizing data exclusively from geostationary communication satellites like GSAT
(B) Relying entirely on deep space probes like Mangalyaan
(C) Using anti-satellite weapons to alter atmospheric pressure zones
(D) Utilizing imaging from remote sensing satellites with SAR payloads.
(E) Answer not known

60. Based on their trajectory and guidance systems, how are the Prithvi and Agni series of missiles classified?
(A) Ballistic missiles
(B) Cruise missiles
(C) Air-to-Air missiles
(D) Anti-radiation missiles
(E) Answer not known

61. Which of the following best defines "Cyber Warfare" in the context of modern national security?
(A) The physical destruction of computer hardware factories
(B) State-sponsored digital attacks on infrastructure and communications.
(C) The use of traditional artillery to destroy enemy communication towers
(D) The encryption of citizen data by private technological corporations
(E) Answer not known

62. Consider the following statements regarding the indigenous aircraft carrier INS Vikrant:
I. It is the first aircraft carrier ever operated by the Indian Navy.
II. It was designed by the Indian Navy's Warship Design Bureau and constructed by Cochin Shipyard Limited.
III. It bolsters India's maritime security and power projection in the Indian Ocean Region.
Which of the above statements are correct?
(A) I and II
(B) II and III
(C) I and III
(D) II only
(E) Answer not known

63. Under the Gaganyaan mission, the astronaut-designates selected for human spaceflight were trained primarily at which international space agency's facilities before indigenous training commenced?
(A) Roscosmos (Russia)
(B) NASA (USA)
(C) ESA (Europe)
(D) CNSA (China)
(E) Answer not known

NODIA

64. Consider the following statements about the BrahMos missile:
I. It is a joint venture between India and Israel.
II. It is capable of being launched from land, sea, sub-sea, and air.
III. It operates on a 'Fire and Forget' principle.
IV. It flies at a supersonic speed of nearly Mach 2.8.
Which of the above statements are correct?
(A) I, II and III
(B) I and IV
(C) II, III and IV
(D) II and IV
(E) Answer not known

65. Who among the following was the Tamil Nadu-born scientist recognized as the "Missile Man of India" and the chief architect of the Integrated Guided Missile Development Programme?
(A) Dr. Vikram Sarabhai
(B) Dr. Satish Dhawan
(C) Dr. Homi J. Bhabha
(D) Dr. A. P. J. Abdul Kalam

36. All of the following are considered mitigation measures for the global concern of Space Debris, EXCEPT:
(A) End-of-life de-orbiting of satellites
(B) Passivation of rocket upper stages to prevent explosions
(C) Active debris removal missions
(D) Intentional fragmentation of aging satellites in Low Earth Orbit
(E) Answer not known

37. Which of the following pairs concerning international space cooperation is correctly matched?
(A) NISAR - Joint Earth-observing mission by ISRO and NASA
(B) TRISHNA - Joint lunar exploration mission by ISRO and Roscosmos
(C) LUPEX - Joint Mars rover mission by ISRO and ESA
(D) Gaganyaan - Exclusive partnership between ISRO and JAXA
(E) Answer not known

38. Based on international reports, which of the following best describes India's position in the global arms trade over the last decade?
(A) India is the world's largest exporter of defence equipment.
(B) India has completely halted the import of foreign arms.
(C) India remains a top arms importer while steadily emerging as a global exporter.
(D) India trades arms exclusively with the Russian Federation.
(E) Answer not known

39. A nuclear triad guarantees a country's ability to retaliate in the event of a preemptive nuclear strike. Conceptually, which platform provides the most survivable 'second strike' capability?
(A) Nuclear-powered ballistic missile submarines (SSBNs)
(B) Silo-based Intercontinental Ballistic Missiles
(C) Strategic stealth bomber aircraft
(D) Mobile surface-to-air missile defense systems
(E) Answer not known

40. Under which classification does the BrahMos missile primarily fall based on its flight profile and speed?
(A) Subsonic ballistic missile
(B) Hypersonic glide vehicle
(C) Intercontinental ballistic missile
(D) Supersonic cruise missile
(E) Answer not known

41. Which of the following provides the precise definition of 'Space Debris' in the context of global orbital environments?
(A) Naturally occurring micrometeoroids originating from asteroid belts
(B) Defunct human-made objects in space that no longer serve a useful function
(C) The atmospheric dust layers present in the stratosphere
(D) Functional communication satellites positioned in the geostationary orbit
(E) Answer not known

42. Consider the following statements regarding the Chandrayaan-2 mission:
I. It was launched by the GSLV Mk III vehicle.
II. The orbiter successfully entered the lunar orbit and performed scientific mapping.
III. The Vikram lander achieved a flawless soft landing on the lunar surface.
Which of the above statements are correct?
(A) I and II
(B) I and III
(C) II only
(D) III only
(E) Answer not known

43. The Kaveri engine was indigenously developed by the Gas Turbine Research Establishment (GTRE) primarily to power which of the following?
(A) INS Arihant
(B) Arjun Main Battle Tank
(C) LVM3 launch vehicle
(D) Light Combat Aircraft (LCA) Tejas
(E) Answer not known

44. Consider the following statements about the PSLV's record launch in 2017:
I. It launched exactly 104 satellites in a single flight.
II. The mission was designated as PSLV-C37.

Click Here to Buy book on Amazon

(D) Cartosat, Resourcesat
(E) Answer not known

72. Which of the following statements about India's defence exports under the "Make in India" initiative is incorrect?
(A) India exports defense equipment to more than 80 countries.
(B) The Akash Surface-to-Air Missile system has been approved for export to friendly foreign nations.
(C) The defense exports of India have reached an all-time high in recent fiscal years.
(D) Private sector companies are strictly prohibited from participating in defense manufacturing for export.
(E) Answer not known

73. Match the Indian military aircraft with their respective categories:
List I: (Military Aircraft)
P. Tejas
Q. C-17 Globemaster III
R. Netra
S. Apache AH-64E
List II: (Category)
I. Attack Helicopter
II. Airborne Early Warning and Control
III. Heavy Lift Transport Aircraft
IV. Light Combat Aircraft
(A) P-IV, Q-III, R-II, S-I
(B) P-III, Q-IV, R-I, S-II
(C) P-IV, Q-I, R-III, S-II
(D) P-I, Q-II, R-IV, S-III
(E) Answer not known

74. Which of the following pairs concerning the Gaganyaan crew module test vehicles is correctly matched?
(A) LVM3 - Reusable uncrewed space shuttle
(B) RLV-TD - Heavy lift launch vehicle for Gaganyaan
(C) TV-D1 - Test Vehicle for in-flight abort demonstration
(D) SSLV - Primary launch vehicle for Indian astronauts
(E) Answer not known

75. Arrange the following components of a typical satellite communication link in the correct operational sequence:
I. Downlink transmission
II. Satellite transponder processing
III. Uplink transmission from Earth station
IV. Reception at the user terminal
(A) III, II, I, IV
(B) I, II, III, IV
(C) III, I, II, IV
(D) II, III, I, IV
(E) Answer not known

76. All of the following laboratories operate under the Defence Research and Development Organisation (DRDO), EXCEPT:
(A) Liquid Propulsion Systems Centre (LPSC)
(B) Aeronautical Development Establishment (ADE)
(C) Solid State Physics Laboratory (SSPL)
(D) Defence Research and Development Laboratory (DRDL)
(E) Answer not known

77. Which of the following pairs of Indian defence start-ups and their focus areas is incorrectly matched?
(A) Agnikul Cosmos - 3D printed rocket engines
(B) BrahMos Aerospace - Private agricultural drones
(C) Skyroot Aerospace - Private launch vehicles
(D) Pixxel - High-resolution hyperspectral earth imaging
(E) Answer not known

78. Which of the following is the most appropriate strategic implication of India's convergence of defence and space research?
(A) It allows India to colonize other planets for military bases.
(B) It enables dual-use systems for civilian welfare and military awareness.
(C) It ensures the privatization of all nuclear weapons facilities.
(D) It permits ISRO to legally manufacture conventional firearms for the infantry.
(E) Answer not known

79. When an earth observation satellite is placed in a Sun-synchronous orbit, how does it conceptually benefit agricultural monitoring?
(A) Consistent lighting for comparative imaging at the same solar time.
(B) The satellite remains stationary over a single

Downloaded from www.pdf.tube

List I: (Naval Asset)
P. INS Vikramaditya
Q. INS Arihant
R. INS Kalvari
S. INS Visakhapatnam
List II: (Designated Role)
I. Nuclear-powered ballistic missile submarine
II. Aircraft Carrier
III. Stealth Guided Missile Destroyer
IV. Diesel-electric attack submarine
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-II, Q-IV, R-I, S-III
(D) P-III, Q-I, R-II, S-IV
(E) Answer not known

94. Which of the following pairs concerning the Gaganyaan crew selection is correctly matched?
(A) Astronaut Candidates - Selected from the Indian Navy's submarine corps
(B) Group Captain Prasanth Balakrishnan Nair - One of the astronaut-designates for Gaganyaan
(C) Training Facility - Exclusively conducted at the Kennedy Space Center, USA
(D) Gaganyatris - The designation for the robotic humanoid sent before the crew
(E) Answer not known

95. Arrange the orbits based on their altitude from the Earth's surface, from lowest to highest:
I. Medium Earth Orbit (MEO)
II. Low Earth Orbit (LEO)
III. Geostationary Orbit (GEO)
(A) I, II, III
(B) II, I, III
(C) III, I, II
(D) II, III, I
(E) Answer not known

96. All of the following are objectives of the NewSpace India Limited (NSIL), EXCEPT:
(A) Transfer of ISRO's technologies to the Indian industry
(B) Production of PSLV and SSLV through the private sector
(C) Acting as the regulatory authority to impose fines on private space companies
(D) Securing commercial launch service agreements with foreign clients
(E) Answer not known

97. Which of the following pairs of Indian defence technologies and their foreign collaborators is correctly matched?
(A) BrahMos Missile - France
(B) S-400 Triumf - United States
(C) Rafale Fighter Jet - Russia
(D) Barak-8 Surface-to-Air Missile - Israel
(E) Answer not known

98. Which of the following is the most appropriate countermeasure against the rising threat of autonomous weapons and Artificial Intelligence in warfare?
(A) Reverting all military technology strictly to analog and mechanical mechanisms
(B) Banning the use of computer networks in the military altogether
(C) Developing AI-driven cyber defense and global treaties on autonomous weapons.
(D) Restricting AI research strictly to the agricultural sector
(E) Answer not known

NODIA

99. In satellite communication, why is the 'Ka-band' conceptually more beneficial for high-speed internet services than the lower frequency 'C-band'?
(A) Ka-band waves can penetrate deep oceans effortlessly.
(B) Higher bandwidth and data transfer rates for high-speed broadband.
(C) Ka-band requires massive, heavily industrialized dish antennas for reception.
(D) Ka-band frequencies are completely immune to rain fade and atmospheric attenuation.
(E) Answer not known

100. Based on their application, the RISAT (Radar Imaging Satellite) series launched by ISRO is classified under:
(A) Deep Space Probes
(B) Geostationary Communication Satellites
(C) Global Positioning System Satellites
(D) Microwave Remote Sensing Satellites
(E) Answer not known

101. When comparing the PSLV and the LVM3 launch vehicles, which of the following statements is true?
(A) LVM3 is utilized for heavier payloads to

87. Match the Space and Defence key personnel in List I with their associated achievements in List II:

List I: (Personnel)

P. Vikram Sarabhai
Q. Satish Dhawan
R. K. Sivan
S. S. Somanath

List II: (Achievement)

I. Oversaw the successful soft landing of Chandrayaan-3
II. Chairman of ISRO during the Chandrayaan-2 mission
III. Directed the experimental phase of ISRO and establishment of VSSC
IV. Institutionalized the Indian space program and SLV projects

(A) P-III, Q-IV, R-II, S-I
(B) P-IV, Q-III, R-I, S-II
(C) P-I, Q-II, R-III, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

88. Which of the following statements correctly identifies the function of the Vikram lander's ChaSTE (Chandra's Surface Thermophysical Experiment) payload?

(A) To map the entire topography of the Moon's far side
(B) To act as a communication relay directly to NASA's deep space network
(C) To drill deep into the lunar mantle and extract rock samples for Earth return
(D) To measure lunar surface thermal properties near the south pole.
(E) Answer not known

89. Consider the following statements regarding India's Defence Corridors:

I. Two Defence Industrial Corridors have been established in India.
II. One corridor is located in Uttar Pradesh.
III. The second corridor is located in Tamil Nadu.
IV. The Tamil Nadu corridor includes nodes like Chennai, Coimbatore, and Tiruchirappalli.
V. The primary aim is to increase the import of foreign arms at a subsidized rate.

Which of the above statements is incorrect?

(A) I, II, III and IV
(B) II, III, IV and V
(C) I, II and V
(D) V only
(E) Answer not known

90. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.

Assertion (A): India's space program places a heavy emphasis on societal applications rather than just planetary exploration.

Reason (R): Satellites are extensively used for tele-education, telemedicine, and natural resource mapping in rural India.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

91. Select the correct sequence of steps involved in the launch profile of the Gaganyaan mission.

(A) Orbital insertion, Ascent phase, Re-entry, Splashdown
(B) Ascent phase, Orbital insertion, Re-entry, Splashdown
(C) Ascent phase, Re-entry, Orbital insertion, Splashdown
(D) Re-entry, Ascent phase, Orbital insertion, Splashdown
(E) Answer not known

92. Which of the following statements about India's NavIC (Navigation with Indian Constellation) is incorrect?

(A) It relies entirely on the GPS satellites operated by the United States for time synchronization.
(B) It consists of seven satellites in geostationary and geosynchronous orbits.
(C) It provides an absolute position accuracy of less than 20 meters over India.
(D) Its coverage area extends up to 1,500 km beyond the Indian border.
(E) Answer not known

93. Match the Indian naval assets in List I with their designated roles in List II:

Click Here to Buy book on Amazon

farm continuously.
(C) The satellite can physically alter weather patterns to induce rainfall over drought-hit areas.
(D) The orbit allows the satellite to be closer to the sun, enhancing its solar panel efficiency exponentially.
(E) Answer not known

80. Based on their operational domains, how are the DRDO-developed systems 'Nirbhay' and 'Shaurya' classified?
(A) Anti-submarine torpedoes
(B) Early warning radar systems
(C) Subsonic cruise missile and Hypersonic surface-to-surface tactical missile respectively
(D) Unmanned combat aerial vehicles
(E) Answer not known

81. Which of the following best defines "Dual-Use Technology" in the context of Space and Defence?
(A) Technology that can be used simultaneously by two different countries
(B) Technology that requires two separate power sources to function
(C) Technology that can only be deployed in a hybrid land-water environment
(D) Civilian or commercial technology with potential military utility.
(E) Answer not known

82. Consider the following statements regarding the Akash missile system:
I. It is an indigenous surface-to-air missile defense system.
II. It was developed by DRDO under the IGMDP.
III. It is an intercontinental ballistic missile designed for strategic nuclear strikes.
Which of the above statements are correct?
(A) I and II
(B) II and III
(C) III only
(D) I only
(E) Answer not known

83. The indigenously built Light Combat Helicopter (LCH) inducted into the Indian Air Force and Army is named:
(A) Dhruv
(B) Prachand
(C) Rudra
(D) Chetak
(E) Answer not known

84. Consider the following statements about ISRO's LVM3 (formerly GSLV Mk III):
I. It is capable of placing a 4-tonne class payload into Geosynchronous Transfer Orbit (GTO).
II. It uses a solid propellant core stage and liquid boosters.
III. The CE-20 cryogenic engine powers its upper stage.
IV. It successfully launched the Chandrayaan-2 and Chandrayaan-3 missions.
Which of the above statements are correct?
(A) I, II and III
(B) I, III and IV
(C) I and IV
(D) II and III
(E) Answer not known

85. The "Shiv Shakti Point" on the Moon is located near the:
(A) Lunar Equator
(B) Lunar North Pole
(C) Lunar South Pole
(D) Sea of Tranquility
(E) Answer not known

86. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The Geostationary Orbit (GEO) is highly congested with communication satellites.
Reason (R): Satellites in GEO match the Earth's rotational period, appearing stationary to ground antennas, which is ideal for constant communication links.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

GEO, while PSLV is used for LEO.
(B) PSLV is purely a liquid-stage vehicle, while LVM3 is purely solid.
(C) PSLV uses a cryogenic engine in its final stage, while LVM3 relies on air-breathing scramjet technology.
(D) Both launch vehicles have exactly identical payload capacities to polar orbits.
(E) Answer not known

102. Consider the following statements regarding the payload instruments of Chandrayaan-3:
I. APXS (Alpha Particle X-ray Spectrometer) is designed to determine the elemental composition of the lunar soil.
II. SHAPE (Spectro-polarimetry of Habitable Planet Earth) is an orbiter payload to study Earth from lunar orbit.
III. The mission entirely lacked any seismic measurement instruments.
Which of the above statements are correct?
(A) I and II
(B) II and III
(C) I only
(D) III only
(E) Answer not known

103. Which of the following is a distinguishing feature of the Cartosat series of satellites?
(A) High-resolution cameras used for cartography and urban planning.
(B) They are positioned exclusively in Geostationary orbit for telecommunications.
(C) They are deep-space observatories meant to study black holes.
(D) They serve strictly as global navigation nodes similar to the GPS system.
(E) Answer not known

104. Consider the following statements about India's missile systems:
I. The Agni-V is a solid-fueled intercontinental ballistic missile.
II. The Prithvi series consists of surface-to-air defense missiles.
III. Astra is an indigenously developed Beyond Visual Range (BVR) air-to-air missile.
IV. Nag is a third-generation "fire-and-forget" anti-tank guided missile.
Which of the above statements are correct?
(A) I, II and III
(B) I, III and IV
(C) I and IV
(D) II and III
(E) Answer not known

105. The 'Nirbhay' missile developed by DRDO is a prime example of which category of weapons?
(A) Intercontinental Ballistic Missile (ICBM)
(B) Subsonic Cruise Missile
(C) Anti-Satellite (ASAT) Weapon
(D) Torpedo
(E) Answer not known

106. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The establishment of the Defence Space Agency (DSA) underlines India's recognition of space as a critical military domain.
Reason (R): DSA is tasked with operating space-assets to safeguard India's interests against emerging threats like anti-satellite weapons and cyber-attacks on satellites.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

107. Match the indigenous helicopter variants developed by HAL in List I with their descriptions in List II:
List I: (Helicopter Variant)
P. ALH Dhruv
Q. LCH Prachand
R. LUH
S. Chetak
List II: (Description)
I. Light Utility Helicopter meant to replace Cheetah and Chetak
II. Legacy light helicopter built under license
III. Advanced Light Helicopter (multi-role)
IV. Light Combat Helicopter designed for high-altitude warfare
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I

Downloaded from www.pdf.tube

(C) P-I, Q-II, R-IV, S-III
(D) P-II, Q-I, R-III, S-IV
(E) Answer not known

108. The INSAT-3D and INSAT-3DR satellites belong to which specific category of satellite applications?
(A) Meteorological Observation and Weather Forecasting
(B) Dedicated Military Reconnaissance
(C) Planetary Exploration
(D) Deep Space Astronomy
(E) Answer not known

109. Consider the following statements regarding the Gaganyaan crew module:
I. It is designed to sustain a three-member crew.
II. It possesses an autonomous environmental control and life support system (ECLSS).
III. It will utilize an ablation thermal protection system during re-entry.
IV. It will make a parachute-assisted splashdown in the Arabian Sea or Bay of Bengal.
V. It will permanently remain in orbit as India's first space station.
Which of the above statements is incorrect?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) V only
(E) Answer not known

110. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): Remote sensing satellites are typically placed in Sun-synchronous Polar Orbits.
Reason (R): This ensures that the satellite passes over any given point of the Earth's surface at the same local solar time, providing consistent illumination for imaging.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

111. Select the correct operational sequence of the GSLV launch stages from lift-off to payload deployment.
(A) Cryogenic Upper Stage, Solid Booster Stage, Liquid Propellant Stage
(B) Solid Booster Stage, Liquid Propellant Stage, Cryogenic Upper Stage
(C) Liquid Propellant Stage, Cryogenic Upper Stage, Solid Booster Stage
(D) Liquid Propellant Stage, Solid Booster Stage, Cryogenic Upper Stage
(E) Answer not known

112. The Indian Navy's Project 75 primarily serves as a category for the development and induction of:
(A) Nuclear-powered aircraft carriers
(B) BrahMos armed stealth frigates
(C) Scorpene-class diesel-electric submarines
(D) Amphibious assault ships
(E) Answer not known

113. Match the DRDO specialized laboratories in List I with their prime technology focus areas in List II:
List I: (DRDO Laboratory)
P. CAIR (Centre for Artificial Intelligence and Robotics)
Q. GTRE (Gas Turbine Research Establishment)
R. DEAL (Defence Electronics Applications Laboratory)
S. HEMRL (High Energy Materials Research Laboratory)
List II: (Focus Area)
I. Propellants and explosives
II. Aero-engines and derivatives
III. AI, Robotics, and Command/Control systems
IV. Communication and radar systems
(A) P-III, Q-II, R-IV, S-I
(B) P-II, Q-III, R-I, S-IV
(C) P-III, Q-I, R-IV, S-II
(D) P-IV, Q-II, R-III, S-I
(E) Answer not known

114. Which of the following pairs linking Indian space missions and their launch vehicles is correctly matched?

(A) Chandrayaan-1 - LVM3
(B) Aditya-L1 - GSLV Mk II
(C) Mangalyaan - PSLV-XL
(D) Gaganyaan TV-D1 - ASLV
(E) Answer not known

115. Arrange the following steps of the Chandrayaan-3 landing sequence in correct chronological order:
I. Rough Braking Phase
II. Attitude Hold Phase
III. Fine Braking Phase
IV. Vertical Descent and Touchdown
(A) I, II, III, IV
(B) II, I, III, IV
(C) I, III, II, IV
(D) III, I, IV, II
(E) Answer not known

116. When addressing the issue of space debris, which of the following is considered the LEAST effective mitigation strategy?
(A) Designing satellites to burn up in the atmosphere post-mission
(B) Performing collision avoidance maneuvers
(C) Designing rocket stages to vent residual fuel to prevent explosions
(D) Painting satellites black to render them invisible to optical telescopes
(E) Answer not known

117. Which of the following pairs concerning the Tamil Nadu Defence Industrial Corridor nodes and their associated specialization is correctly matched?
(A) Avadi - Armoured vehicles and heavy machinery
(B) Tiruchirappalli - Aerospace avionics exclusively
(C) Salem - Submarine hull manufacturing
(D) Coimbatore - Naval warship assembly
(E) Answer not known

118. Inferences drawn from the data of the Pragyan rover indicate the presence of Sulphur on the lunar surface. What scientific inference does this primarily support?
(A) The Moon possesses an active volcanic core capable of sustaining life.
(B) Sulphur can be directly extracted to synthesize rocket fuel for return journeys.
(C) Insights into magmatic activities and the Moon's geological evolution.
(D) The lunar surface was heavily industrialized by ancient civilizations.
(E) Answer not known

119. What is a primary DISADVANTAGE of using solid propellants in rockets compared to liquid propellants?
(A) Solid propellants cannot be throttled or shut down once ignited.
(B) Solid propellants are highly unstable during prolonged storage.
(C) Solid propellants require extremely low cryogenic temperatures to remain viable.
(D) Solid propellants provide significantly lower initial thrust than liquid propellants.
(E) Answer not known

120. Which of the following represents a major ADVANTAGE of utilizing Small Satellite Launch Vehicles (SSLV) over traditional heavy-lift vehicles like the LVM3?
(A) SSLVs possess a much larger payload capacity for Geostationary orbits.
(B) SSLVs rely exclusively on reusable air-breathing scramjet stages.
(C) SSLVs are the only vehicles capable of carrying humans to space.
(D) Lower cost, launch-on-demand flexibility, and quick turnaround times.
(E) Answer not known

121. In comparing the BrahMos and the Agni-V missiles, which of the following outlines their primary functional difference?
(A) BrahMos is an unguided rocket, while Agni-V is a wire-guided missile.
(B) BrahMos is a supersonic cruise missile; Agni-V is an ICBM.
(C) BrahMos is exclusively a submarine-launched ballistic missile, whereas Agni-V is an air-to-air missile.
(D) BrahMos utilizes nuclear propulsion, while Agni-V uses a scramjet engine.
(E) Answer not known

122. Consider the following statements about India's nuclear submarine program:
I. INS Arihant is India's first indigenously built nuclear-powered ballistic missile submarine.

Click Here to Buy book on Amazon

ANSWERS

1. (D) The application of orbital technologies for earth observation, communication, and socio-economic growth
Space science serves as a cornerstone for a nation's progress by leveraging satellite technology. Orbital systems enable critical functions like weather forecasting, distance education, and telecommunication. These advancements directly contribute to socio-economic development by providing data for disaster management and resource mapping. Utilizing space-based assets ensures that modern infrastructure remains robust and capable of supporting a growing population.

2. (A) I and II
Sputnik 1 initiated the space age as the first artificial satellite, while Apollo 11 achieved the historic milestone of landing humans on the Moon. Although India's Aryabhata was a significant achievement, it was launched using a Soviet vehicle rather than an indigenous rocket. These events collectively represent the foundational successes of global and national efforts in exploring the lunar surface.

3. (B) 1969
The Indian Space Research Organisation was established on August 15, 1969, to expand the nation's space capabilities. It took over the responsibilities of the Indian National Committee for Space Research, which had been formed earlier. This institutional shift allowed for a more organized approach toward developing indigenous launch vehicles and satellites, ultimately leading to India's self-reliance in space technology.

4. (A) I, II and III
The Indian space program is structured to ensure high-level oversight and specialized development across various centers. The Department of Space, overseen by the Prime Minister, manages ISRO's strategic direction. Key facilities include the Vikram Sarabhai Space Centre for launch vehicle design and the ISRO Propulsion Complex for liquid engine testing. This integrated framework facilitates the successful execution of complex missions.

5. (A) SLV-3
India achieved a major milestone in 1980 by successfully launching the Rohini RS-1 satellite into orbit. This feat was accomplished using the Satellite Launch Vehicle-3, which was the nation's first experimental satellite launcher. This success demonstrated India's growing technical expertise and made it the sixth country to possess the capability to launch satellites using its own indigenously developed rocket systems.

6. (A) Both A and R are true and R is the correct explanation of A.
The Polar Satellite Launch Vehicle has earned its reputation as a dependable workhorse due to its consistent performance over decades. Its reliability is demonstrated by its successful deployment of critical missions, including India's first lunar probe and the mission to Mars. The vehicle's versatile design allows it to place various satellites into different orbits, supporting both national and international space requirements.

7. (A) P-IV, Q-I, R-II, S-III
Various satellite orbits are utilized based on specific mission requirements and altitude ranges. Low Earth Orbit is ideal for space stations, while Medium Earth Orbit is the standard for global positioning constellations. Geostationary orbits are essential for fixed communication links, and Sun-synchronous orbits provide the consistent solar lighting necessary for effective Earth observation and high-quality remote sensing imagery for agricultural monitoring.

8. (D) It is a three-stage vehicle featuring an indigenous cryogenic upper propulsion system.
The Launch Vehicle Mark-3 is a heavy-lift rocket designed to transport significant payloads into geostationary transfer orbits. It features a sophisticated three-stage design, including a powerful indigenous cryogenic upper stage. This propulsion system allows the vehicle to carry four-tonne class satellites, making it a critical

NODIA

129. Consider the following statements regarding India's Defence Technology policies:
I. The Defence Procurement Procedure emphasizes the "Buy (Indian-IDDM)" category.
II. IDDM stands for Indigenously Designed, Developed and Manufactured.
III. Foreign Direct Investment (FDI) in defence manufacturing is strictly capped at 0%.
IV. The 'Make in India' campaign promotes self-reliance in defence.
V. India has successfully exported the Pinaka rocket system to Armenia.
Which of the above statements is incorrect?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, II and V
(D) III only
(E) Answer not known

130. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): Cryogenic rocket engines are highly complex to develop and maintain.
Reason (R): They use propellants like liquid oxygen and liquid hydrogen which must be stored at extremely low temperatures, requiring advanced thermal insulation and metallurgy.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

131. Select the correct sequence indicating the hierarchical structure of ISRO's governance, from the highest authority downwards.
(A) ISRO Council, Department of Space, Space Commission, Prime Minister
(B) Prime Minister, Space Commission, Department of Space, ISRO
(C) Space Commission, Prime Minister, ISRO, Department of Space
(D) Department of Space, ISRO, Space Commission, Prime Minister
(E) Answer not known

132. Which of the following payloads of the Aditya-L1 mission is the MOST relevant for studying the dynamic events of the solar corona, such as Coronal Mass Ejections (CMEs)?
(A) SUIT (Solar Ultraviolet Imaging Telescope)
(B) ASPEX (Aditya Solar wind Particle Experiment)
(C) MAG (Advanced Tri-axial High Resolution Digital Magnetometers)
(D) VELC (Visible Emission Line Coronagraph)
(E) Answer not known

133. Match the Indian missile systems in List I with their primary operational platform or nature in List II:
List I: (Missile System)
P. Astra
Q. K-15 Sagarika
R. Prahaar
S. Helina
List II: (Platform/Nature)
I. Submarine-Launched Ballistic Missile
II. Air-to-Air Missile
III. Helicopter-launched Anti-Tank Guided Missile
IV. Short-range surface-to-surface tactical missile
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-II, S-I
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

134. Which of the following pairs concerning ISRO's communication satellites is correctly matched?
(A) GSAT-30 - Earth observation and high-resolution imaging
(B) INSAT-3DR - Navigation satellite for civil aviation
(C) GSAT-7 (Rukmini) - Dedicated communication satellite for the Indian Navy
(D) GSAT-24 - Planetary probe for deep space telemetry
(E) Answer not known

135. Arrange the following defense systems from the oldest to the most recently inducted into the Indian armed forces:
I. S-400 Triumf
II. INS Vikramaditya
III. Tejas Mk1

NODIA

I. The astronaut designates were selected from the Indian Air Force's test pilot pool.
II. They received initial generic spaceflight training at the Yuri Gagarin Cosmonaut Training Center in Russia.
III. The Institute of Aerospace Medicine (IAM) in Bengaluru is heavily involved in their physiological training.
IV. A humanoid robot named 'Vyommitra' will fly on uncrewed precursor missions.
V. The crew has been permanently assigned to live on the International Space Station for five years prior to the mission.

Which of the above statements is incorrect?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III and V
(D) V only
(E) Answer not known

150. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.

Assertion (A): India's regional navigation system, NavIC, utilizes the L5 and S bands for signal transmission.

Reason (R): Dual-frequency transmission helps mitigate ionospheric delay errors, providing more accurate position information compared to single-frequency receivers.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

151. Select the correct sequential path of a data signal during an Earth observation satellite's functional cycle.
(A) Sensor image capture, Onboard processing, Downlink to ground station, Data dissemination to users
(B) Downlink to ground station, Sensor image capture, Onboard processing, Data dissemination to users
(C) Onboard processing, Data dissemination to users, Sensor image capture, Downlink to ground station
(D) Sensor image capture, Data dissemination to users, Downlink to ground station, Onboard processing
(E) Answer not known

152. Which of the following elements of a satellite system is LEAST likely to be affected by space debris in Low Earth Orbit?
(A) Solar panels
(B) Optical camera lenses
(C) Communication antennas on the satellite
(D) Ground control station antennas
(E) Answer not known

153. Match the Indian naval and air platforms in List I with their source/collaborator country in List II:

List I: (Military Platform)
P. INS Vikramaditya
Q. Rafale Fighter
R. C-130J
S. Phalcon AWACS

List II: (Source Country)
I. Russia
II. France
III. United States
IV. Israel

(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-I, Q-III, R-II, S-IV
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

154. Which of the following pairs linking Indian Defense exports to the acquiring country is correctly matched?
(A) LCA Tejas - Argentina
(B) INS Arihant - Sri Lanka
(C) BrahMos Missile System - Philippines
(D) Pinaka Multi-Barrel Rocket Launcher - Ukraine
(E) Answer not known

155. Arrange the orbits based on their typical inclination relative to the Earth's equator, from the lowest degree to the highest degree:
I. Geostationary Orbit (GEO)
II. Sun-Synchronous Polar Orbit
(A) I, II
(B) II, I

Downloaded from www.pdf.tube

(E) Answer not known

143. Which of the following is the key defining feature of the Ramjet propulsion technology utilized in the BrahMos missile?
(A) It uses forward speed to compress air for fuel combustion without oxidizers.
(B) It carries both liquid fuel and liquid oxidizer internally for combustion in the vacuum of space.
(C) It relies entirely on battery-powered electric propellers for its entire flight path.
(D) It employs nuclear fission to heat an onboard fluid, providing thrust.
(E) Answer not known

144. Consider the following statements about the Defense Research and Development Organisation (DRDO):
I. It was formed by the amalgamation of the Technical Development Establishment and the Directorate of Technical Development & Production.
II. It operates under the Ministry of Defence.
III. The Integrated Guided Missile Development Programme was its flagship project.
IV. It exclusively focuses on importing aerospace technologies from foreign vendors.
Which of the above statements are correct?
(A) I, II and III
(B) II, III and IV
(C) I and IV
(D) I and III
(E) Answer not known

145. The 'Nethra' project initiated by ISRO is a prime example of which functional category in space science?
(A) Planetary Rover Exploration
(B) Human Spaceflight Crew Training
(C) Deep Sea Submersible Navigation
(D) Space Situational Awareness and Space Debris Monitoring
(E) Answer not known

146. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The adoption of Artificial Intelligence in defense systems poses ethical and operational challenges.
Reason (R): Lethal Autonomous Weapons Systems (LAWS) can potentially identify and engage targets without human intervention, raising concerns about accountability and erroneous targeting.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

NODIA

147. Match the Indian space startups in List I with their primary technological focus or achievement in List II:
List I: (Space Startup)
P. Agnikul Cosmos
Q. Skyroot Aerospace
R. Pixxel
S. Bellatrix Aerospace
List II: (Focus/Achievement)
I. Development of hyperspectral earth imaging satellites
II. First Indian private company to launch a rocket (Vikram-S)
III. Development of semi-cryogenic 3D printed rocket engines
IV. In-space propulsion systems and orbital transfer vehicles
(A) P-III, Q-II, R-I, S-IV
(B) P-II, Q-III, R-IV, S-I
(C) P-IV, Q-I, R-II, S-III
(D) P-III, Q-I, R-IV, S-II
(E) Answer not known

148. In the context of national security, which of the following DRDO achievements is MOST relevant for providing battlefield transparency and enemy troop monitoring to field commanders?
(A) Agni-V Intercontinental Ballistic Missile
(B) K-15 Sagarika Submarine Launched Missile
(C) Varunastra Heavy Weight Torpedo
(D) Netra Airborne Early Warning and Control (AEW&C) System
(E) Answer not known

149. Consider the following statements about the Gaganyaan crew selection and training process:

II. INS Arighat is the second submarine in the Arihant-class.
III. These submarines strictly carry conventional torpedoes and lack nuclear capabilities.
Which of the above statements are correct?
(A) I and II
(B) I and III
(C) I only
(D) II only
(E) Answer not known

123. Which of the following is a primary feature of the 'Kessler Syndrome' in the context of space debris?
(A) The sudden atmospheric drag that pulls satellites out of orbit during a solar flare
(B) The psychological stress experienced by astronauts during long-duration spaceflights
(C) The legal framework governing the retrieval of crashed satellites on foreign soil
(D) A cascading effect of collisions rendering orbital paths unusable.
(E) Answer not known

124. Consider the following statements regarding ISRO's navigation capabilities:
I. GAGAN is a satellite-based augmentation system developed by ISRO and the Airports Authority of India.
II. NavIC requires a massive constellation of 24 satellites to function over India.
III. GAGAN improves the accuracy and integrity of GPS signals for civil aviation.
IV. NavIC operates using L-band and S-band frequencies.
Which of the above statements are correct?
(A) I, II and III
(B) I, III and IV
(C) I and IV
(D) II and III
(E) Answer not known

125. The GSAT series of satellites primarily serves as an example of which of the following technological applications?
(A) Deep Space Telemetry
(B) High-throughput Telecommunications and DTH Broadcasting
(C) Ocean Surface Topography
(D) Tactical Battlefield Surveillance
(E) Answer not known

126. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Examine these two statements carefully and select the correct answer.
Assertion (A): The DRDO focuses heavily on developing dual-use technologies.
Reason (R): Technologies like radar systems, unmanned aerial vehicles, and specialized materials can be utilized for both armed forces and civilian security applications.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

127. Match the stages of the PSLV rocket in List I with their respective propellant types in List II:
List I: (PSLV Stage)
P. First Stage (PS1)
Q. Second Stage (PS2)
R. Third Stage (PS3)
S. Fourth Stage (PS4)
List II: (Propellant Type)
I. Earth storable liquid propellant (Vikas engine)
II. Solid propellant motor
III. Solid propellant (HTPB based)
IV. Liquid propellant (MMH + MON3)
(A) P-II, Q-I, R-III, S-IV
(B) P-I, Q-II, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-IV, Q-III, R-II, S-I
(E) Answer not known

128. What is a primary ADVANTAGE of India's indigenous development of the CE-20 cryogenic engine for the LVM3?
(A) It relies on solid propellants, which are easier to store and handle.
(B) It eliminates the need for any tracking and telemetry stations on the ground.
(C) Increased payload capacity for GTO compared to solid/liquid stages.
(D) It restricts the launch vehicle from flying beyond the Low Earth Orbit, saving costs.
(E) Answer not known

Click Here to Buy book on Amazon

(C) Both have the same inclination
(D) Inclination is not applicable to orbits
(E) Answer not known

156. If a nation successfully demonstrates Anti-Satellite (ASAT) technology using a direct-ascent kinetic kill vehicle, what strategic capability does this predominantly imply?
(A) Destruction of an adversary's space-based navigation and communication assets.
(B) The ability to jam enemy radio frequencies using ground towers
(C) The capability to capture enemy satellites intact and bring them to Earth
(D) The capacity to deploy lasers that can intercept intercontinental ballistic missiles in the boost phase
(E) Answer not known

157. Which of the following pairs related to ISRO's spaceflight records is correctly matched?
(A) LVM3 M4 - Launch of Mangalyaan
(B) PSLV-C37 - Launch of 104 satellites
(C) SLV-3 - First Indian Human Spaceflight
(D) ASLV - Launch of the James Webb Space Telescope
(E) Answer not known

158. In comparing the developmental approach of the Tejas LCA and the Su-30 MKI, which statement is factually correct?
(A) Tejas was entirely imported from Russia, while Su-30 MKI is an indigenous Indian design from scratch.
(B) Tejas is an indigenous ADA/HAL design; Su-30 MKI is Russian-origin licensed production.
(C) Both aircraft were jointly developed with the United States under the 'Make in India' framework.
(D) Tejas is a heavy bomber, whereas Su-30 MKI is a light utility aircraft.
(E) Answer not known

159. Which of the following is a key feature of the 'Shiv Shakti Point' designated by the Government of India?
(A) The landing site of the Chandrayaan-3 Vikram lander on the lunar surface.
(B) It marks the exact location where the Chandrayaan-1 impact probe struck the moon.
(C) It is the highest mountainous peak on the far side of the Moon.
(D) It is the designated crater where the Pragyan rover was permanently disabled by extreme cold.
(E) Answer not known

160. Which distinctive feature identifies the 'Astra' missile developed by DRDO?
(A) It is a heavily armored surface-to-surface anti-tank missile.
(B) It is a nuclear-powered cruise missile with a global strike range.
(C) It is a Beyond Visual Range air-to-air missile targeting supersonic aircraft.
(D) It is an underwater ballistic missile deployed strictly on diesel-electric submarines.
(E) Answer not known

www.nodia.in
NODIA

(A) I, II, III
(B) II, III, I
(C) III, II, I
(D) II, I, III
(E) Answer not known

136. Considering the strategic capabilities of the S-400 Triumf air defense system, what inference can be made about its role in India's defense architecture?
(A) It is primarily designed to conduct preemptive strikes on enemy ground targets.
(B) It functions as a replacement for all indigenous fighter aircraft development.
(C) It serves as a specialized naval platform for advanced anti-submarine warfare.
(D) It creates an air defense umbrella against hostile aircraft and missiles.
(E) Answer not known

137. Which of the following pairs concerning Indian defense exports is incorrectly matched?
(A) BrahMos - Philippines
(B) S-400 Triumf - Vietnam
(C) Pinaka Rocket System - Armenia
(D) Swathi Weapon Locating Radar - Armenia
(E) Answer not known

138. If the Gaganyaan mission successfully places Indian astronauts in Low Earth Orbit, what broader strategic inference can be drawn regarding India's space program?
(A) India will immediately cease all unmanned satellite launches to focus entirely on human missions.
(B) The LVM3 will be permanently retired in favor of the Space Shuttle.
(C) Mastery of life-support, escape systems, and heavy-lift capability.
(D) India will exclusively focus its space budget on lunar colonization.
(E) Answer not known

139. Based on ISRO's increasing reliance on NewSpace India Limited (NSIL) for commercial satellite launches, what can be inferred about the future trajectory of India's space sector?
(A) A shift towards complete militarization of all space assets
(B) The privatization of ISRO's deep-space missions like Chandrayaan and Mangalyaan
(C) A total withdrawal of government funding from the space sector
(D) ISRO focuses on deep-space R&D while NSIL handles commercial operations.
(E) Answer not known

140. What is an inherent DISADVANTAGE of utilizing the Geostationary Orbit (GEO) for global communication satellites compared to Low Earth Orbit (LEO) constellations?
(A) GEO satellites suffer from significantly higher latency due to vast distances.
(B) GEO satellites require constant maneuverability to maintain a steady view of a single Earth location.
(C) GEO orbits decay much faster, requiring satellite replacement every two years.
(D) GEO satellites cannot cover the Earth's equator effectively.
(E) Answer not known

141. When comparing an Air-to-Air Missile (AAM) like Astra with a Surface-to-Air Missile (SAM) like Akash, which feature primarily distinguishes their operational deployment?
(A) Astra is launched from a stationary ground pad, while Akash is launched from a fighter jet.
(B) Astra is launched from aircraft; Akash is launched from mobile ground systems.
(C) Astra utilizes a ramjet engine for underwater travel, while Akash is an exo-atmospheric interceptor.
(D) Astra requires nuclear warheads, whereas Akash uses kinetic kill vehicles exclusively.
(E) Answer not known

142. Consider the following statements regarding the indigenous Light Combat Aircraft (LCA) Tejas:
I. It features a tailless, compound delta wing design.
II. It is a twin-engine heavyweight stealth fighter.
III. The naval variant of Tejas has successfully demonstrated arrested landings on an aircraft carrier.
Which of the above statements are correct?
(A) I and II
(B) I and III
(C) I only
(D) II only

Downloaded from www.pdf.tube

asset for India's communication infrastructure and ambitious deep-space exploration projects like lunar missions.

9. (D) I, IV and V
The Navigation with Indian Constellation system, also known as the Indian Regional Navigation Satellite System, utilizes a specific configuration of seven satellites. This constellation includes three satellites positioned in geostationary orbit and four in geosynchronous orbit. It is designed to provide highly accurate positioning services for both civilian and strategic users, covering the Indian landmass and extending significantly beyond borders.

10. (A) Both A and R are true and R is the correct explanation of A.
The Chandrayaan-1 mission transformed our understanding of the Moon by providing evidence of water molecules. Using the Moon Mineralogy Mapper, a specialized instrument provided by NASA, the probe detected hydroxyl and water ice signatures in the polar regions. This discovery was a landmark achievement in lunar science, significantly influencing future global missions and the potential for long-term human exploration.

11. (B) SLV-3, ASLV, PSLV, GSLV, LVM3
The development of India's launch vehicles began with the Satellite Launch Vehicle-3, followed by the Augmented Satellite Launch Vehicle to test new technologies. The Polar Satellite Launch Vehicle then became the reliable workhorse for various missions. Later, the Geosynchronous Satellite Launch Vehicle was introduced, eventually leading to the powerful LVM3, which is currently the nation's heaviest and most advanced launcher.

12. (A) The mission is designed to land a rover on the solar surface.
The Aditya-L1 mission is a sophisticated solar observatory positioned at the first Lagrange point of the Sun-Earth system. Its primary goal is to study the Sun's atmosphere, including the corona and solar winds, using dedicated scientific instruments. Landing on the solar surface is physically impossible due to the extreme heat and the gaseous nature of the Sun's outer layers.

NODIA

13. (A) P-II, Q-III, R-I, S-IV
India's satellite constellations are designed for diverse and specific purposes. The INSAT and GSAT series are primarily dedicated to telecommunications and broadcasting services across the country. The Indian Remote Sensing satellites focus on resource monitoring and agricultural management. Additionally, the Cartosat series provides high-resolution mapping and cartographic data, which is essential for urban planning and detailed geographic information system applications.

14. (B) BrahMos - Supersonic cruise missile
The BrahMos is a highly advanced supersonic cruise missile developed through a collaborative effort between India and Russia. Known for its incredible speed and precision, it can be launched from land, sea, and air platforms. Other missile systems serve different roles, such as the Agni series for long-range ballistic deterrence and the Akash system for providing surface-to-air defense.

15. (A) II, IV, III, I
The Agni missile series represents a significant advancement in India's strategic deterrence capabilities, with each variant offering an increased operational reach. The progression starts with short-range systems and moves toward intermediate and intercontinental capabilities. This development ensures a comprehensive range of options for national defense, starting from one thousand kilometers and extending to over five thousand kilometers for global security.

16. (C) Dedicated deep space planetary exploration missions
Remote sensing satellites are specifically designed to observe the Earth's surface for terrestrial applications. They provide critical data for monitoring agricultural yields, mapping forest cover, and identifying groundwater prospects. While they are essential for managing natural resources and environmental changes on Earth, they are distinct from deep space probes, which are launched to explore other planets and celestial bodies.

17. (D) Mylswamy Annadurai - Coimbatore
Several prominent scientists from Tamil Nadu have played leading roles in India's space

achievements. Dr. Mylswamy Annadurai, hailing from the Coimbatore district, served as the project director for the landmark Chandrayaan-1 and Mangalyaan missions. These individuals have contributed significantly to the nation's scientific progress, ensuring the successful execution of complex lunar and interplanetary explorations through their leadership and expertise.

18. (C) To offer a direct southern launch trajectory for SSLVs without maneuvering around Sri Lanka.
Establishing a new spaceport at Kulasekarapattinam offers a strategic advantage for launching small satellites into polar orbits. This location allows for a direct southern flight path, eliminating the need for complex maneuvers to avoid flying over neighboring landmasses like Sri Lanka. Such efficiency saves fuel and increases the payload capacity of launch vehicles, particularly for the newer small satellite categories.

19. (B) Geostationary Orbit
Geostationary orbits are essential for continuous monitoring of a specific region on Earth. Since satellites in this orbit match the rotational period of the planet, they remain fixed over a single geographic location. This positioning is ideal for weather forecasting and disaster management, as it allows for real-time tracking of storm systems and environmental changes across the entire Indian subcontinent.

20. (D) Unmanned Aerial Vehicle (UAV)
Rustom is a specialized medium-altitude long-endurance unmanned aerial vehicle developed for surveillance and reconnaissance operations. It allows the armed forces to gather real-time intelligence and monitor border regions without putting human pilots at risk. This technology represents a significant step in the indigenization of defense systems, providing advanced capabilities for threat detection and battlefield management in various combat scenarios.

21. (A) An engine using liquid oxygen and hydrogen at extremely low temperatures.
A cryogenic engine utilizes liquid propellants that are stored at extremely low temperatures to provide high energy efficiency. These engines typically use liquid hydrogen as fuel and liquid oxygen as an oxidizer. This advanced propulsion technology is essential for heavy-lift launch vehicles, as it allows for the transport of significant payloads into higher orbits with greater fuel economy.

22. (C) II only
India's mission to Mars achieved historic success by entering the red planet's orbit on its very first attempt. This accomplishment made India the first Asian nation to reach Mars, showcasing incredible precision and efficiency. Although the mission utilized the proven Polar Satellite Launch Vehicle rather than a heavier rocket, the complexity of the orbital insertion demonstrated ISRO's advanced engineering capabilities.

23. (A) Avadi, Tamil Nadu
The Combat Vehicles Research and Development Establishment is a premier defense laboratory located in Avadi, near Chennai. It specializes in the design and development of armored fighting vehicles and tracked systems for the Indian Army. Its most notable achievement is the Arjun Main Battle Tank, which incorporates indigenous technology to enhance the mobility and firepower of land forces.

24. (D) III only
The Chandrayaan-3 mission successfully demonstrated a soft landing on the lunar south pole, making India the first nation to achieve this feat. While the landing site was named Shiv Shakti Point, other locations from previous missions also received official names. The mission's rover and lander conducted vital experiments, confirming the presence of elements like sulphur through indigenous scientific payloads.

25. (B) To act as a single-window nodal agency for authorizing private space activities.
The Indian National Space Promotion and Authorization Centre was established to facilitate and regulate the participation of the private sector in space activities. It serves as an autonomous agency that provides a single-window clearance for non-governmental entities. This initiative aims to foster innovation, encourage commercial ventures, and allow ISRO to focus more on research and deep-space exploration.

Click Here to Buy book on Amazon

26. (C) A is true but R is false.
The development of the Tejas Light Combat Aircraft represents a major success in the indigenization of India's aerospace industry. It is a highly maneuverable, single-engine multirole fighter designed to meet the requirements of the air force and navy. Unlike heavy twin-engine fighters, its lightweight design and advanced composite materials make it a versatile platform for modern aerial combat operations.

27. (A) P-IV, Q-III, R-I, S-II
India's missile programs are categorized by their specific operational roles and ranges. The Agni series provides strategic ballistic deterrence, while the Prithvi missiles serve as short-range surface-to-surface tactical weapons. The Akash system is designed for surface-to-air defense against aerial threats, and the Nag missile is a specialized anti-tank guided weapon, ensuring comprehensive defense capabilities across different battlefield environments.

28. (A) To demonstrate human spaceflight capability in a 400 km low Earth orbit.
The Gaganyaan mission is a landmark initiative aimed at demonstrating India's capability to send humans into space. The program involves launching a crew of astronauts into a low Earth orbit for a multi-day mission before safely returning them to Earth. This mission requires the development of critical technologies, including life support systems, crew escape mechanisms, and complex re-entry procedures.

29. (D) IV only
India has significantly boosted its indigenous defense production and exports through various government initiatives. The nation has successfully exported advanced systems like the BrahMos missile and established defense industrial corridors to foster manufacturing. While India is emerging as a global exporter, it has not yet surpassed nations like the United States in terms of the total volume of arms exports.

30. (A) Both A and R are true and R is the correct explanation of A.
Mission Shakti was a strategic demonstration of India's ability to defend its assets in outer space. By successfully intercepting a live satellite in low Earth orbit using a kinetic kill vehicle, the nation joined an elite group of countries with anti-satellite capabilities. This test served as a credible deterrent, ensuring that the country's space-based infrastructure remains protected from potential threats.

31. (A) Agni-V, Mirage-2000, INS Arihant
A nuclear triad consists of the capability to launch nuclear weapons from land, air, and sea platforms. India achieved this status through the deployment of Agni missiles, strategic bomber aircraft like the Mirage-2000, and nuclear-powered submarines such as the INS Arihant. This multi-platform approach ensures a credible second-strike capability, which is essential for maintaining strategic stability and national deterrence.

32. (C) It has the authority to oversee commercial operations of foreign agencies exclusively.
The Indian National Space Promotion and Authorization Centre is an autonomous body designed to encourage the domestic private sector's involvement in space. It acts as a bridge between ISRO and private companies, ensuring that commercial space activities align with national interests. Its role is focused on empowering Indian industries rather than exclusively managing the operations of foreign space agencies.

33. (A) P-II, Q-IV, R-I, S-III
ISRO operates through various specialized centers located across the country. The headquarters are in Bengaluru, while the primary launch site is the Satish Dhawan Space Centre in Sriharikota. Vehicle development is centralized at the Vikram Sarabhai Space Centre in Thiruvananthapuram, and propulsion systems are tested at the Mahendragiri facility. This distributed network ensures efficient management of various space missions.

34. (C) Kaveri - Main Battle Tank
India has developed several indigenous defense systems to enhance its military self-reliance. The INS Vikrant is a sophisticated aircraft carrier, and the Pinaka is a powerful multi-barrel rocket launcher. While the Kaveri project was an attempt to develop an aero-engine for fighter jets, it is not a main battle tank; the Arjun fulfills that specific role for land forces.

Downloaded from www.pdf.tube

35. (A) II, III, IV, I
India's journey in space exploration is marked by significant historical milestones. It began with the launch of the Aryabhata satellite in 1975, followed by the successful development of the Polar Satellite Launch Vehicle in the 1990s. The program later expanded to deep-space exploration with the Chandrayaan-1 lunar mission in 2008 and the historic Mars Orbiter Mission launched in 2013.

36. (D) Intentional fragmentation of aging satellites in Low Earth Orbit
Mitigating space debris is essential for the long-term sustainability of orbital environments. Strategies include de-orbiting defunct satellites at the end of their missions and passivating rocket stages to prevent accidental explosions. While active removal missions are being developed, the intentional destruction or fragmentation of satellites is discouraged. Such actions significantly increase the volume of hazardous fragments, endangering operational space assets.

37. (A) NISAR - Joint Earth-observing mission by ISRO and NASA
International collaboration is a key aspect of modern space exploration. The NISAR mission is a prominent example of a joint project between ISRO and NASA, focusing on advanced Earth observation using dual-frequency radar. Such partnerships allow for the sharing of technical expertise and resources, leading to more comprehensive scientific data and the development of sophisticated technologies for global monitoring.

38. (C) India remains a top arms importer while steadily emerging as a global exporter.
India's position in the global arms market is undergoing a significant transformation. While the nation continues to import advanced military technology to meet its immediate security needs, there is a strong emphasis on indigenous manufacturing. This shift has led to an increase in defense exports, showcasing India's growing capability to produce and supply sophisticated equipment to the international community.

NODIA

39. (A) Nuclear-powered ballistic missile submarines (SSBNs)
Nuclear-powered ballistic missile submarines are considered the most survivable component of a nuclear triad. Due to their ability to remain submerged and undetected for long periods, they are less vulnerable to a preemptive strike. This ensures that a nation can maintain a credible second-strike capability, which is a fundamental requirement for effective strategic deterrence and ensuring national security.

40. (D) Supersonic cruise missile
The BrahMos missile is a highly advanced supersonic cruise weapon developed through a joint venture between India and Russia. It is capable of traveling at speeds nearly three times the speed of sound, making it extremely difficult for enemy defenses to intercept. Its versatile design allows it to be launched from multiple platforms, including land, sea, and air combat systems.

41. (B) Defunct human-made objects in space that no longer serve a useful function
Space debris refers to the collection of non-functional man-made objects orbiting the Earth. This includes spent rocket stages, defunct satellites, and fragments from collisions or explosions. As the number of objects in orbit increases, the risk of collisions with operational spacecraft also grows. Managing this debris is critical to maintaining a safe environment for communication, navigation, and scientific research.

42. (A) I and II
The Chandrayaan-2 mission was a complex undertaking that involved an orbiter, a lander, and a rover. While the orbiter successfully entered the lunar orbit and continues to provide valuable scientific data, the lander experienced a hard landing on the surface. Despite this setback, the mission demonstrated India's capability to reach lunar orbit and conduct advanced high-resolution mapping of the Moon.

43. (D) Light Combat Aircraft (LCA) Tejas
The Kaveri engine project was an indigenous effort to develop a high-performance turbofan engine for the Light Combat Aircraft. Although it faced several technical challenges during

development, the project provided valuable experience in aero-engine technology. The goal was to achieve self-reliance in powering indigenous fighter jets, reducing dependence on foreign suppliers for critical propulsion systems in modern military aviation.

44. (A) I, II and IV
In 2017, ISRO achieved a remarkable world record by launching 104 satellites in a single mission using the PSLV-C37. This mission demonstrated the high reliability and cost-effectiveness of the launch vehicle in the global commercial market. While most of the satellites were from foreign nations, the success highlighted India's growing prowess in providing reliable and efficient rideshare launch services.

45. (B) Dr. Mylswamy Annadurai
Dr. Mylswamy Annadurai, a distinguished scientist from Tamil Nadu, played a pivotal role as the project director for India's first lunar mission. His leadership was instrumental in the success of Chandrayaan-1, which discovered water molecules on the Moon. He also contributed significantly to subsequent planetary missions, solidifying his legacy as one of the key architects of India's modern space program.

46. (A) Both A and R are true and R is the correct explanation of A.
The Polar Satellite Launch Vehicle has become a preferred choice for launching small satellites due to its consistent success rate and affordability. Its ability to carry multiple satellites in a single flight allows various organizations and startups to access space at a lower cost. This commercial capability has significantly contributed to the growth of the global small satellite industry.

47. (A) P-I, Q-II, R-III, S-IV
ISRO's organizational structure consists of centers with specialized roles to ensure mission success. The U R Rao Satellite Centre focuses on satellite design, while the Space Applications Centre develops payloads for societal benefits. The Master Control Facility manages geostationary satellites, and the Liquid Propulsion Systems Centre specializes in engine development. This division of labor allows for expertise in every phase of space technology.

48. (C) It is the lunar landing site of the Chandrayaan-3 Vikram lander.
Shiv Shakti Point is the official name designated for the spot where the Chandrayaan-3 lander touched down on the Moon. This location near the lunar south pole represents a historic achievement for India's space program. The name commemorates the scientific and collaborative spirit behind the mission, marking the site as a permanent symbol of the nation's successful lunar exploration efforts.

49. (D) IV only
India's defense strategy is built on a robust nuclear triad, ensuring the ability to respond to threats from land, air, and sea. While the nation maintains a strict no-first-use policy, it possesses advanced delivery systems like the intercontinental Agni-V. This posture of credible minimum deterrence is supported by indigenous organizations like DRDO, which develop the necessary strategic technologies for national security.

50. (C) A is true but R is false.
The creation of NewSpace India Limited is aimed at commercializing the technologies developed by ISRO and increasing industry participation. This strategic shift allows the private sector to handle routine launches and satellite production, while ISRO focuses its resources on advanced research and exploration. This model fosters economic growth without compromising the nation's commitment to scientific discovery and high-end technological development.

51. (B) Troposphere, Stratosphere, Mesosphere, Thermosphere, Exosphere
During a space launch, vehicles must pass through various atmospheric layers, each with distinct physical properties. Starting from the surface, the troposphere is followed by the stratosphere and the mesosphere. Beyond these, the thermosphere and exosphere represent the outer reaches where the atmosphere gradually fades into space. Understanding these layers is critical for managing aerodynamic heating and ensuring structural integrity.

Click Here to Buy book on Amazon

this position remain fixed relative to a point on the Earth's surface. This allows for continuous data transmission and broadcasting without the need for complex tracking antennas on the ground. However, the unique properties of this orbit make it highly sought after and increasingly crowded with satellites.

87. (A) P-III, Q-IV, R-II, S-I
The success of India's space program is the result of leadership from several visionary scientists and administrators. Early pioneers institutionalized the program and developed the first launch vehicles. Subsequent leaders oversaw complex missions to the Moon and Mars, demonstrating the nation's growing technical prowess. The recent successful soft landing on the lunar surface marks another milestone achieved through continuous institutional excellence.

88. (D) To measure lunar surface thermal properties near the south pole.
The ChaSTE payload on the Vikram lander was specifically designed to study the thermal behavior of the lunar surface. By measuring the temperature at different depths near the south pole, the instrument provided the first-ever detailed data on the Moon's thermophysical properties in that region. This information is critical for understanding the lunar environment and planning future human and robotic missions.

89. (D) V only
India has established two major defense industrial corridors in Uttar Pradesh and Tamil Nadu to promote indigenous manufacturing and self-reliance. These corridors include several nodes that specialize in various military technologies, from armored vehicles to aerospace components. The primary objective is to reduce the nation's dependence on foreign imports and foster a robust domestic ecosystem for defense production and exports.

90. (A) Both A and R are true and R is the correct explanation of A.
India's space program is uniquely focused on using satellite technology for the direct benefit of society. Programs like tele-education and telemedicine bring essential services to remote and rural areas. Additionally, satellites provide vital data for managing natural resources and disaster response. This commitment to societal applications ensures that the benefits of space research are accessible to all citizens across the nation.

91. (B) Ascent phase, Orbital insertion, Re-entry, Splashdown
A human spaceflight mission follows a carefully planned sequence to ensure the safety of the crew. It begins with a powerful ascent through the atmosphere into space. Once in orbit, the module circles the Earth for several days. Finally, the mission concludes with a controlled re-entry into the atmosphere and a safe splashdown in the ocean, where the crew is recovered.

NODIA

92. (A) It relies entirely on the GPS satellites operated by the United States for time synchronization.
NavIC is an independent regional navigation system developed by India to provide precise positioning services without depending on foreign systems. It consists of a constellation of seven satellites in geostationary and geosynchronous orbits, offering coverage across the country and its surroundings. By maintaining its own timing and signal infrastructure, India ensures its strategic autonomy in navigation and critical communication services.

93. (A) P-II, Q-I, R-IV, S-III
The Indian Navy operates a variety of powerful assets to maintain maritime security. These include massive aircraft carriers for power projection and nuclear-powered submarines that provide a credible deterrent. Additionally, stealth destroyers and diesel-electric submarines offer versatile capabilities for both surface and underwater warfare. Together, these platforms ensure that the nation can protect its interests across the vast Indian Ocean region.

94. (B) Group Captain Prasanth Balakrishnan Nair - One of the astronaut-designates for Gaganyaan
The selection of astronauts for the Gaganyaan mission involved a rigorous process, with candidates primarily chosen from the pool of experienced test pilots. These individuals undergo extensive training both internationally and domestically to prepare for the challenges of spaceflight. Their roles are central to the mission's goal of demonstrating India's capability

are guided during the initial powered phase of flight and then fall under the influence of gravity. They are a critical part of India's strategic deterrence, designed to carry various payloads across different distances to ensure national security.

61. (B) State-sponsored digital attacks on infrastructure and communications.
Cyber warfare involves the strategic use of digital attacks to disrupt or damage the vital infrastructure of an adversary. These state-sponsored activities target communication networks, financial systems, and power grids without traditional physical combat. Protecting national security in the modern era requires robust defensive measures against these virtual threats, which can be as devastating as conventional military engagements on the battlefield.

62. (B) II and III
The INS Vikrant is the first indigenously designed and built aircraft carrier, marking a major achievement for India's maritime industry. Constructed by Cochin Shipyard Limited, it significantly enhances the Navy's ability to project power across the Indian Ocean. While the Navy has operated carriers before, the Vikrant represents a significant leap in domestic warship design and manufacturing capabilities for maritime security.

63. (A) Roscosmos (Russia)
For the Gaganyaan mission, the selected astronaut-designates underwent an initial phase of specialized training in Russia. This collaboration with Roscosmos provided them with essential experience in spaceflight dynamics and survival techniques. Following this international training, the astronauts continued their preparation in India, focusing on indigenous mission systems and simulators to ensure they are fully prepared for the nation's first human spaceflight.

64. (C) II, III and IV
The BrahMos is a highly advanced supersonic cruise missile developed through a joint venture between India and Russia. It is capable of traveling at speeds nearly three times the speed of sound and operates on a fire-and-forget principle. Its versatile design allows it to be launched from land, sea, and air platforms, making it a critical asset for the armed forces.

65. (D) Dr. A. P. J. Abdul Kalam
Dr. A.P.J. Abdul Kalam, often referred to as the Missile Man of India, was a visionary scientist who spearheaded the nation's missile development programs. Born in Tamil Nadu, his leadership of the Integrated Guided Missile Development Programme led to the creation of the Agni and Prithvi missiles. His contributions were fundamental in achieving self-reliance in strategic defense technologies for national security.

66. (A) Both A and R are true and R is the correct explanation of A.
The induction of the INS Arihant into the Indian Navy was a historic milestone that completed the nation's nuclear triad. As a nuclear-powered ballistic missile submarine, it provides a stable and survivable platform for launching missiles from underwater. This capability ensures that the country maintains a credible second-strike deterrent, which is essential for preserving strategic stability in the region.

67. (A) P-II, Q-I, R-IV, S-III
Lagrange points are specific locations in space where the gravitational forces of two large bodies, like the Earth and the Sun, create stable regions. These points are ideal for positioning telescopes and observatories. For example, L1 offers an uninterrupted view of the Sun, while L2 is shielded from solar radiation, making it perfect for deep-space observatories like the James Webb Telescope.

68. (D) A three-stage solid vehicle for launching 500 kg satellites into LEO.
The Small Satellite Launch Vehicle was developed to provide low-cost and frequent access to space for small satellites. It is a three-stage rocket that uses solid propulsion, allowing for quick assembly and minimal launch infrastructure. This vehicle is specifically designed to cater to the growing global market for small satellite launches, offering flexibility and rapid turnaround times for various missions.

Downloaded from www.pdf.tube

69. (D) V only
International guidelines emphasize the importance of mitigating space debris to ensure the safety of future missions. Strategies include de-orbiting defunct satellites and monitoring orbital objects through projects like NETRA. While India has established dedicated systems for space situational awareness, there are no global mandates that require the use of anti-satellite missiles to destroy defunct satellites, as such actions create more debris.

70. (A) Both A and R are true and R is the correct explanation of A.
The Polar Satellite Launch Vehicle utilizes a unique four-stage configuration that alternates between solid and liquid propulsion. This design provides high initial thrust from the solid motors and precise control for orbital insertion from the liquid stages. This combination has contributed to the vehicle's long history of success, making it one of the most reliable launchers in the world.

71. (A) GAGAN, NavIC
India has developed two primary satellite-based systems to enhance navigation and positioning capabilities. GAGAN is designed to improve the accuracy of GPS signals for civil aviation over the Indian airspace. NavIC, on the other hand, is an independent regional navigation system that provides precise positioning services across the country and its surrounding regions, ensuring self-reliance in critical navigation technology.

72. (D) Private sector companies are strictly prohibited from participating in defense manufacturing for export.
The "Make in India" initiative has significantly increased the participation of the private sector in defense manufacturing. Many private companies are now involved in developing and exporting military hardware to numerous countries. This shift has led to record-high defense exports, with indigenous systems like the Akash missile being approved for international sales, reflecting the nation's growing industrial and technological strength.

73. (A) P-IV, Q-III, R-II, S-I
The Indian military utilizes a diverse range of aircraft to perform various roles. The Tejas is a modern light combat aircraft, while the C-17 Globemaster provides heavy-lift transport capabilities. The Netra system serves as an airborne early warning platform, and the Apache is a highly advanced attack helicopter. These platforms collectively ensure that the armed forces can operate effectively across different domains.

74. (C) TV-D1 - Test Vehicle for in-flight abort demonstration
The Gaganyaan mission involves several critical tests to ensure the safety of the astronauts. The TV-D1 mission was specifically designed to demonstrate the crew escape system's effectiveness during an in-flight abort scenario. These tests are essential for validating the technology that will protect the crew in case of an emergency, marking a significant step toward achieving successful human spaceflight.

75. (A) III, II, I, IV
A satellite communication link follows a logical sequence to transmit data across vast distances. It begins with an uplink transmission from a ground station to the satellite. Onboard transponders then process the signal before transmitting it back to Earth via a downlink. Finally, the signal is received by a user terminal, completing the process that enables telecommunication and broadcasting services.

76. (A) Liquid Propulsion Systems Centre (LPSC)
The Defence Research and Development Organisation operates numerous laboratories specialized in various military technologies, including aeronautics and electronics. These facilities focus on developing indigenous weapons and defense systems. However, the Liquid Propulsion Systems Centre is a major facility under the Indian Space Research Organisation, primarily responsible for the development of liquid and cryogenic propulsion systems for the nation's satellite launch vehicles.

77. (B) BrahMos Aerospace - Private agricultural drones
India's aerospace sector is seeing a surge in startups focusing on innovative technologies like 3D printed engines and hyperspectral imaging. Companies like Agnikul Cosmos and Skyroot Aerospace are developing private launch vehicles, while Pixxel is focused on Earth

NODIA

observation. BrahMos Aerospace, however, is a well-established joint venture between the Indian and Russian governments, primarily dedicated to producing advanced supersonic cruise missiles.

78. (B) It enables dual-use systems for civilian welfare and military awareness.
The convergence of space and defense research allows for the development of dual-use technologies that serve both civilian and military purposes. For example, satellite systems used for disaster management can also provide critical intelligence for national security. This integrated approach ensures that technological advancements benefit society as a whole while enhancing the nation's strategic capabilities and awareness of potential threats.

79. (A) Consistent lighting for comparative imaging at the same solar time.
Sun-synchronous orbits are particularly beneficial for agricultural monitoring because they ensure a satellite passes over a specific area at the same local solar time. This consistency provides uniform lighting conditions for Earth observation, making it easier to compare images taken over different days. Such data is essential for tracking crop growth, assessing health, and predicting yields with high accuracy.

80. (C) Subsonic cruise missile and Hypersonic surface-to-surface tactical missile respectively
The Nirbhay and Shaurya missiles represent different categories of advanced strike capabilities. Nirbhay is a long-range subsonic cruise missile capable of loitering and flying at very low altitudes to avoid radar detection. In contrast, the Shaurya is a high-speed hypersonic tactical missile designed for surface-to-surface strikes. Both systems enhance the military's ability to engage targets with high precision and varying speeds.

81. (D) Civilian or commercial technology with potential military utility.
Dual-use technology refers to products and systems that have both civilian and military applications. In the space and defense sectors, this often includes satellite navigation, communication systems, and remote sensing imagery. Such technologies are developed to support economic growth and societal welfare while also providing critical capabilities for national security, highlighting the interconnected nature of modern scientific and strategic research.

82. (A) I and II
The Akash is an indigenous surface-to-air missile system developed to provide defense against various aerial threats, including aircraft and drones. It was created under the Integrated Guided Missile Development Programme and features advanced radar and guidance technology. While it is a critical part of the nation's air defense architecture, it is not designed for intercontinental or strategic nuclear strikes.

83. (B) Prachand
The Prachand is a light combat helicopter specifically designed for high-altitude warfare and versatile combat roles. Inducted into both the Air Force and the Army, it is the only attack helicopter in the world capable of landing and taking off at altitudes above five thousand meters. This capability makes it an essential asset for operations in difficult mountainous terrain and border regions.

84. (B) I, III and IV
The LVM3 is India's most powerful launch vehicle, capable of carrying heavy satellites into geosynchronous transfer orbit. It features a three-stage design, including two large solid boosters and a sophisticated cryogenic upper stage. This vehicle has been instrumental in launching significant missions, including India's lunar explorations, demonstrating the nation's advanced capability in heavy-lift space transportation and interplanetary travel.

85. (C) Lunar South Pole
Shiv Shakti Point is the designated landing site of the Chandrayaan-3 mission, located in the vicinity of the lunar south pole. This region is of immense scientific interest due to the presence of water ice and its unique geological features. The successful landing in this area established India as a pioneer in exploring the previously unreached southern regions of the Moon.

86. (A) Both A and R are true and R is the correct explanation of A.
The geostationary orbit is a vital resource for global communications because satellites in

Click Here to Buy book on Amazon

52. (D) AI guarantees the complete removal of human casualties in all combat scenarios.
Artificial intelligence is increasingly being integrated into defense systems to improve surveillance, predictive maintenance, and data analysis. While autonomous drones and AI algorithms enhance operational efficiency and threat perception, they cannot guarantee the total elimination of human casualties in conflict. Human judgment remains essential in decision-making processes, particularly in complex battlefield scenarios where ethical and strategic considerations are paramount.

53. (A) P-III, Q-IV, R-I, S-II
India's space missions have achieved several groundbreaking scientific results. Chandrayaan-1 confirmed the presence of water molecules on the Moon, while the Mars Orbiter Mission demonstrated successful interplanetary orbital insertion. Chandrayaan-3 achieved a historic soft landing near the lunar south pole, and the Aditya-L1 mission is dedicated to studying the Sun's corona and solar winds from a strategic Lagrange point.

54. (C) PSLV - primarily used for launching Earth Observation satellites into Polar orbits
The Polar Satellite Launch Vehicle is a highly versatile rocket primarily designed to place Earth observation satellites into polar orbits. Over the years, it has demonstrated incredible reliability and has been used for various missions, including lunar and interplanetary probes. Its multi-stage design allows it to launch several satellites simultaneously, making it a key asset for domestic and international launches.

55. (A) I, II, III
India has a long history of indigenous aircraft development, starting with the HF-24 Marut in the 1960s. This was followed by the Light Combat Aircraft Tejas, which incorporated advanced materials and digital flight controls. More recently, the focus has expanded to include unmanned aerial vehicles like the Rustom, demonstrating a continuous evolution in the nation's aerospace design and manufacturing capabilities.

56. (D) Deep ocean floor mineral extraction
Space technology has become integral to modern life through applications such as telecommunication, navigation, and weather monitoring. Satellites enable television broadcasting and provide precise GPS data for smartphones. They also play a vital role in early warning systems for natural disasters like cyclones. While space technology assists in mapping ocean resources, deep-sea mineral extraction is primarily a maritime engineering challenge.

57. (B) Naval Base INS Kadamba - Chennai
Tamil Nadu is home to several important defense installations that support the nation's military readiness. These include the Heavy Vehicles Factory in Avadi and the Ordnance Factory in Tiruchirappalli. While Chennai has various naval facilities, the major naval base known as INS Kadamba is located in Karwar, Karnataka. These centers collectively contribute to the development and maintenance of critical defense hardware.

58. (C) It provides a continuous view of the Sun without occultation or eclipses.
Placing a spacecraft at the first Lagrange point allows it to maintain a stable position between the Earth and the Sun. This location is ideal for solar observation because it provides an uninterrupted view of the Sun without any interference from the Earth or the Moon. It ensures that scientific instruments can continuously monitor solar activity and its effects on the space environment.

59. (D) Utilizing imaging from remote sensing satellites with SAR payloads.
Remote sensing satellites equipped with Synthetic Aperture Radar are essential for disaster management because they can provide clear images even through clouds or during the night. This capability is vital for tracking the path of cyclones and mapping the extent of flooding in real-time. The data obtained allows authorities to plan effective rescue operations and assess damage in affected regions quickly.

60. (A) Ballistic missiles
The Prithvi and Agni series are classified as ballistic missiles because they follow a suborbital flight path to reach their targets. These missiles

NODIA

to launch and sustain a human presence in low Earth orbit.

95. (B) II, I, III
Earth orbits are categorized by their altitude, each serving different technological purposes. Low Earth Orbit is the closest, making it ideal for imaging and space stations. Medium Earth Orbit is higher and commonly used for navigation constellations. Geostationary Orbit is the highest, allowing satellites to remain fixed over a single spot on the Earth's surface, which is essential for telecommunications.

96. (C) Acting as the regulatory authority to impose fines on private space companies
NewSpace India Limited was established as the commercial arm of ISRO to foster industry participation and technology transfer. Its goals include productionizing launch vehicles through private partnerships and securing international launch contracts. While it manages commercial operations, it does not serve as a regulatory body; that role is handled by other agencies to ensure a clear separation between business and oversight.

97. (D) Barak-8 Surface-to-Air Missile - Israel
India's defense capabilities are enhanced through various international collaborations. The Barak-8 is a prominent example of a surface-to-air missile system jointly developed with Israel. Such partnerships allow for the integration of advanced technologies into indigenous platforms. While India also acquires systems from other nations like Russia and France, these collaborations focus on the joint development of sophisticated hardware for national security.

98. (C) Developing AI-driven cyber defense and global treaties on autonomous weapons.
The rise of artificial intelligence in warfare presents new challenges that require both technological and diplomatic solutions. Developing advanced cyber defense systems can protect against AI-driven threats while creating international treaties ensures ethical guidelines for the use of autonomous weapons. This balanced approach aims to harness the benefits of AI for security while mitigating the risks associated with unmanned and automated combat systems.

99. (B) Higher bandwidth and data transfer rates for high-speed broadband.
In satellite communication, the Ka-band offers significantly more bandwidth compared to lower frequency bands. This allows for much higher data transfer rates, making it ideal for providing high-speed internet and broadband services. While higher frequencies can be more sensitive to atmospheric conditions, their ability to carry large volumes of data is essential for meeting the growing demand for modern telecommunications.

100. (D) Microwave Remote Sensing Satellites
The RISAT series uses advanced radar imaging technology to observe the Earth's surface. Unlike optical sensors, microwave remote sensing can penetrate cloud cover and operate in total darkness. This capability ensures that the satellites can provide critical data for agriculture and disaster management under all weather conditions, making them a vital component of the nation's remote sensing and surveillance infrastructure.

101. (A) LVM3 is utilized for heavier payloads to GEO, while PSLV is used for LEO.
ISRO utilizes different launch vehicles based on the mass of the payload and the required orbit. The PSLV is a versatile rocket primarily used for placing smaller satellites into low Earth or polar orbits. In contrast, the LVM3 is a heavy-lift launcher designed to carry large communication satellites into geostationary transfer orbits, providing the nation with independent access to space.

102. (A) I and II
The Chandrayaan-3 mission deployed several advanced payloads to investigate the lunar environment. The Alpha Particle X-ray Spectrometer was designed to analyze the chemical and mineralogical composition of the surface soil. Additionally, the Spectro-polarimetry of Habitable Planet Earth payload allowed the orbiter to study Earth's atmosphere from space. These instruments provided valuable data for understanding planetary habitability and geological evolution.

NODIA

120. (D) Lower cost, launch-on-demand flexibility, and quick turnaround times.
The Small Satellite Launch Vehicle provides a significant advantage for the growing commercial space market. Unlike larger rockets that require extensive preparation, these vehicles can be assembled and launched quickly at a much lower cost. This flexibility allows for "launch-on-demand" services, making it easier for startups and academic institutions to place small payloads into orbit without waiting for a larger mission.

121. (B) BrahMos is a supersonic cruise missile; Agni-V is an ICBM.
The BrahMos and Agni-V missiles serve very different strategic roles. The BrahMos is a high-speed cruise missile designed for precision strikes at shorter ranges, using advanced propulsion to travel at supersonic speeds. In contrast, the Agni-V is a long-range ballistic missile capable of carrying nuclear warheads across continents. Together, they provide a comprehensive range of defensive and deterrent capabilities for national security.

122. (A) I and II
India's nuclear submarine program is a major achievement in indigenous naval engineering. The INS Arihant was the first boat of its class, followed by the INS Arighat. These submarines are designed to provide a survivable platform for launching ballistic missiles from underwater. By maintaining a fleet of such vessels, the nation ensures a credible second-strike capability, which is a vital part of its strategic deterrent.

123. (D) A cascading effect of collisions rendering orbital paths unusable.
The Kessler Syndrome is a theoretical scenario where the volume of space debris in low Earth orbit becomes so high that collisions between objects become frequent. Each collision creates more fragments, leading to a self-sustaining cascade of debris. If left unmanaged, this process could eventually make certain orbits too hazardous for satellites, potentially disrupting global communication and navigation systems for decades.

124. (B) I, III and IV
India utilizes various satellite systems to enhance navigation and positioning capabilities. The GAGAN system improves the reliability of signals for civil aviation, while the NavIC constellation provides independent regional positioning. These systems operate using specific frequency bands to ensure accuracy and are essential for both civilian and strategic applications, reducing the nation's dependence on foreign constellations for critical navigation services.

125. (B) High-throughput Telecommunications and DTH Broadcasting
The GSAT series represents India's advanced fleet of communication satellites. They are equipped with numerous transponders to provide high-speed data transfer and broadcasting services. These satellites play a crucial role in enabling direct-to-home television, cellular communication, and broadband internet across the country. Their placement in geostationary orbit ensures continuous and reliable coverage for millions of users, supporting the nation's digital infrastructure.

126. (A) Both A and R are true and R is the correct explanation of A.
Dual-use technologies are central to modern defense research because they can be applied to both military and civilian needs. For example, radar systems and unmanned aerial vehicles developed for the armed forces can also be used for border security and disaster management. This approach ensures that investments in technology provide broad benefits to society while strengthening the nation's overall security and resilience.

127. (A) P-II, Q-I, R-III, S-IV
The PSLV utilizes a complex four-stage design to achieve its high reliability and precision. It alternates between solid motors for high thrust and liquid engines for controlled maneuvering. The use of different propellants in each stage allows the vehicle to optimize its performance as it ascends through the atmosphere and enters orbit, making it one of the most versatile launchers in the world.

128. (C) Increased payload capacity for GTO compared to solid/liquid stages.
Developing indigenous cryogenic engines like the CE-20 is a major technological milestone. These engines are far more efficient than traditional

Downloaded from www.pdf.tube

STUDYING FROM PDFs?

THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

PRINTED BOOKS has up to

4× HIGHER RETENTION

than studying from screens.

PRINT BOOK = BETTER MEMORY

PDF = LOWER RETENTION

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

STAY ONE STEP AHEAD.

is followed by a liquid propellant stage that continues the ascent through the atmosphere. Finally, a high-efficiency cryogenic upper stage provides the final push to place the payload into its target orbit.

112. (C) Scorpene-class diesel-electric submarines
Project 75 is a significant initiative for the Indian Navy, focusing on the construction of advanced diesel-electric submarines. These vessels, based on the Scorpene design, are built indigenously with technical collaboration. They feature advanced stealth technology and various weapon systems, significantly enhancing the Navy's underwater combat capabilities and ensuring a strong defensive presence in the maritime regions surrounding the country.

113. (A) P-III, Q-II, R-IV, S-I
DRDO maintains a network of specialized laboratories, each focused on specific areas of defense technology. These include centers for artificial intelligence and robotics, which develop autonomous systems. Other facilities specialize in aero-engines, communications, and the chemistry of high-energy materials like explosives and propellants. This diverse research environment allows the organization to develop a wide range of indigenous technologies for the armed forces.

114. (C) Mangalyaan - PSLV-XL
Selecting the appropriate launch vehicle is critical for the success of complex space missions. For example, the Mars Orbiter Mission utilized the powerful XL version of the PSLV to achieve the necessary escape velocity. While other launchers like the LVM3 are used for heavier lunar probes, the PSLV's reliability and versatility have made it the preferred choice for several of the nation's most ambitious scientific explorations.

115. (A) I, II, III, IV
The landing of a lunar probe involves a series of complex maneuvers to ensure a safe touchdown. It begins with a rough braking phase to reduce velocity, followed by an attitude hold phase for orientation. The process continues with a fine braking phase for precise control before the final vertical descent. This sequence is critical for managing the transition from orbital speed to a gentle touchdown.

116. (D) Painting satellites black to render them invisible to optical telescopes
Effective space debris mitigation involves technical measures like de-orbiting defunct satellites and passivating fuel tanks. These actions prevent future collisions and explosions that create more fragments. However, changing the visual appearance of a satellite does not address the physical presence of debris. Such actions are ineffective and could even complicate efforts to track and monitor objects in orbit using ground-based systems.

117. (A) Avadi - Armoured vehicles and heavy machinery
The defense industrial corridor in Tamil Nadu leverages existing manufacturing hubs to boost indigenous production. Avadi is well-known for its expertise in heavy machinery and armored vehicles. Other nodes in the corridor focus on various components, including electronics and specialized materials. This integrated approach fosters a domestic ecosystem that supports the military's needs while encouraging innovation and economic growth in the aerospace and defense sectors.

118. (C) Insights into magmatic activities and the Moon's geological evolution.
The discovery of elements like sulphur on the lunar surface provides valuable clues about the Moon's volcanic history. Scientists use this data to understand the composition of the lunar crust and the processes that shaped its current form. Such chemical evidence is essential for reconstructing the geological evolution of the Moon and identifying the materials that may be available for future exploration.

119. (A) Solid propellants cannot be throttled or shut down once ignited.
Solid propellants offer high thrust and are easier to store compared to liquid systems. However, they have a major disadvantage: once the combustion process begins, it cannot be easily stopped or controlled. This lack of flexibility makes them less suitable for the final stages of a mission where precise orbital maneuvers and adjustments are required, though they remain excellent for initial launch stages.

NODIA

its ability to safeguard critical infrastructure and military assets.

137. (B) S-400 Triumf - Vietnam
India has become a successful exporter of various defense systems, including supersonic cruise missiles and multi-barrel rocket launchers. These systems have been acquired by several friendly foreign nations to enhance their own security. While India maintains strong defense ties with many countries, the S-400 is an advanced system acquired by India from Russia, rather than an indigenously developed product for export.

138. (C) Mastery of life-support, escape systems, and heavy-lift capability.
The successful execution of a human spaceflight mission represents a major leap in a nation's technological capability. It requires the development of sophisticated life-support systems to keep the crew safe in the harsh environment of space. Additionally, reliable crew escape mechanisms and heavy-lift rockets are essential. Achieving these goals demonstrates a high level of expertise in engineering and mission management.

139. (D) ISRO focuses on deep-space R&D while NSIL handles commercial operations.
The increasing role of commercial entities in the space sector allows for a more efficient division of labor. By handling routine satellite launches and industry partnerships, commercial organizations allow national space agencies to dedicate more resources to cutting-edge research and deep-space exploration. This model fosters a more dynamic space economy while ensuring that scientific discovery and technological innovation remain a top priority.

140. (A) GEO satellites suffer from significantly higher latency due to vast distances.
Geostationary satellites offer the advantage of fixed coverage, but their extreme distance from Earth introduces a noticeable delay in signal transmission. This latency can affect real-time applications like high-speed gaming or certain types of voice communication. In contrast, satellites in lower orbits provide much faster response times, although they require larger constellations to provide the same continuous geographic coverage as geostationary systems.

141. (B) Astra is launched from aircraft; Akash is launched from mobile ground systems.
The operational deployment of missile systems depends on their intended target and launch platform. Air-to-air missiles like the Astra are designed to be fired from fighter jets to engage enemy aircraft. Conversely, surface-to-air systems like the Akash are deployed on mobile ground launchers to defend against incoming aerial threats. Both are essential for maintaining air superiority and protecting national airspace.

142. (B) I and III
The Tejas is a sophisticated light combat aircraft that features a unique tailless delta wing design for high maneuverability. It was developed to meet the needs of both the Air Force and the Navy, with the naval variant successfully demonstrating the ability to operate from aircraft carriers. This indigenous platform represents a major achievement in domestic aerospace engineering and modern combat capabilities.

143. (A) It uses forward speed to compress air for fuel combustion without oxidizers.
Ramjet technology is a highly efficient form of propulsion used in high-speed missiles. It relies on the vehicle's forward motion to compress incoming air, which is then used for fuel combustion. Because it uses atmospheric oxygen, it does not need to carry a separate oxidizer, making the system lighter and faster. This technology is ideal for maintaining supersonic speeds during flight.

144. (A) I, II and III
The Defence Research and Development Organisation was formed to spearhead the development of indigenous military technologies. Operating under the Ministry of Defence, it has been responsible for several flagship projects, including the development of advanced missile systems. Its focus on self-reliance has led to the creation of various indigenous weapons and defense platforms, reducing the nation's dependence on foreign military hardware.

145. (D) Space Situational Awareness and Space Debris Monitoring
The Nethra project is a critical initiative aimed at protecting national space assets. It focuses on space situational awareness by monitoring

Click Here to Buy book on Amazon

solid or liquid stages, allowing launch vehicles to carry much heavier payloads into high-altitude orbits. This capability is essential for launching large communication satellites and conducting deep-space missions, providing the nation with independent and powerful access to space.

129. (D) III only
India's defense policies are designed to encourage domestic production and international collaboration. The "Make in India" campaign and updated procurement procedures emphasize indigenously designed and manufactured equipment. While the nation promotes self-reliance, it also allows for foreign direct investment in the defense sector to bring in advanced technology and capital, fostering a more robust and competitive industrial environment for national security.

130. (A) Both A and R are true and R is the correct explanation of A.
Cryogenic engines are among the most difficult aerospace technologies to master because they require handling propellants at temperatures far below freezing. Both liquid hydrogen and liquid oxygen must be kept extremely cold, which involves advanced materials and sophisticated thermal insulation. Despite their complexity, these engines are essential for heavy-lift missions because of their high energy efficiency and superior performance in space.

131. (B) Prime Minister, Space Commission, Department of Space, ISRO
The governance of the Indian space program ensures high-level political oversight and professional management. The Prime Minister oversees the Space Commission, which sets the policy and direction for the nation's space activities. These policies are then implemented by the Department of Space, with ISRO serving as the primary organization for research, development, and the execution of various satellite and rocket missions.

132. (D) VELC (Visible Emission Line Coronagraph)
The Visible Emission Line Coronagraph is a key instrument on the Aditya-L1 mission designed to observe the Sun's outer atmosphere. By creating an artificial eclipse, it allows scientists to study the solar corona and dynamic events like coronal mass ejections in great detail. This data is essential for understanding solar behavior and its impact on space weather, which can affect satellite operations.

133. (A) P-II, Q-I, R-IV, S-III
India's missile systems are developed for a wide range of operational environments and platforms. These include air-to-air missiles for aerial combat and specialized ballistic missiles for launch from submarines. Additionally, short-range tactical missiles and helicopter-launched weapons provide versatile strike options on the battlefield. These diverse systems collectively ensure that the armed forces can respond effectively to threats across land, sea, and air.

NODIA

134. (C) GSAT-7 (Rukmini) - Dedicated communication satellite for the Indian Navy
Communication satellites are often designed to meet the specific needs of different user groups. For example, the GSAT-7 is a dedicated satellite that provides secure and reliable communication services for the Indian Navy. This capability is essential for maritime operations, allowing for real-time coordination and data exchange across vast oceanic regions, highlighting the strategic importance of space assets in modern naval warfare.

135. (B) II, III, I
The modernization of the Indian armed forces involves the continuous induction of advanced platforms. This process includes acquiring massive aircraft carriers to project maritime power and developing indigenous light combat aircraft for air defense. More recently, the focus has included the acquisition of sophisticated long-range air defense systems. These milestones represent a steady progression toward achieving a more technologically advanced military.

136. (D) It creates an air defense umbrella against hostile aircraft and missiles.
The S-400 Triumf is one of the most advanced air defense systems in the world, designed to protect large areas from various aerial threats. It can track and intercept multiple targets, including aircraft and ballistic missiles, at long ranges. By deploying this system, the nation creates a powerful defensive umbrella that significantly enhances

forces have access to some of the best military technology available in the world.

154. (C) BrahMos Missile System - Philippines
India has emerged as a significant exporter of advanced defense technology to friendly foreign nations. The sale of the BrahMos supersonic cruise missile system is a major milestone in this effort, showcasing the nation's ability to produce high-end military hardware. Such exports not only boost the domestic defense industry but also strengthen strategic ties with international partners in various parts of the world.

155. (A) I, II
Satellite orbits are defined by their inclination, which is the angle between the orbital plane and the Earth's equator. A geostationary orbit has an inclination of nearly zero degrees, meaning it follows the equator exactly. In contrast, Sun-synchronous polar orbits have much higher inclinations, often near ninety degrees, allowing the satellite to pass over the Earth's poles and provide global coverage.

156. (A) Destruction of an adversary's space-based navigation and communication assets.
Demonstrating anti-satellite technology sends a powerful strategic signal about a nation's ability to protect its interests in space. By showing that it can intercept and destroy an orbiting object, a country proves its capability to disrupt an adversary's critical space-based infrastructure. This includes navigation, communication, and surveillance satellites, which are essential for modern military operations and overall national security.

157. (B) PSLV-C37 - Launch of 104 satellites
ISRO has achieved several historic records that have gained international recognition. One of the most significant was the launch of over one hundred satellites in a single mission using the PSLV. This feat demonstrated the incredible precision and efficiency of the launch vehicle and established India as a leader in the global commercial market for delivering small satellites into orbit.

158. (B) Tejas is an indigenous ADA/HAL design; Su-30 MKI is Russian-origin licensed production.
The Indian Air Force operates a mix of indigenously designed aircraft and foreign-origin platforms. The Tejas is a modern multi-role fighter developed entirely within the country to meet specific requirements. In contrast, the Su-30 MKI is an advanced Russian aircraft built under license in India. This combination allows the nation to build its domestic capabilities while leveraging proven international technology for its security.

159. (A) The landing site of the Chandrayaan-3 Vikram lander on the lunar surface.
Shiv Shakti Point is the official name designated for the spot where the Chandrayaan-3 lander touched down on the Moon. This location near the lunar south pole represents a historic achievement for India's space program. The name commemorates the scientific and collaborative spirit behind the mission, marking the site as a permanent symbol of the nation's successful lunar exploration efforts.

160. (C) It is a Beyond Visual Range air-to-air missile targeting supersonic aircraft.
The Astra missile is a sophisticated air-to-air weapon designed for beyond-visual-range combat. It is capable of engaging high-speed enemy aircraft at various altitudes with high precision. As an indigenously developed system, it reduces reliance on foreign military hardware. Its integration into fighter jets enhances the aerial combat superiority of the armed forces through advanced seeker and guidance technology during flight.

www.nodia.in

Downloaded from www.pdf.tube

orbital debris and other objects that could pose a threat to satellites. By providing early warnings of potential collisions, the system ensures the safety and sustainability of the country's space operations, which is essential for maintaining reliable communication and navigation services.

146. (A) Both A and R are true and R is the correct explanation of A.
The integration of artificial intelligence into defense systems brings significant advantages but also raises important ethical questions. Autonomous systems that can identify and engage targets without direct human intervention pose risks related to accountability and potential errors in judgment. Addressing these concerns through clear policies and ethical guidelines is essential for the responsible development and use of AI in modern warfare.

147. (A) P-III, Q-II, R-I, S-IV
India's space startup ecosystem is rapidly advancing with companies focused on various innovative technologies. These include the development of 3D-printed rocket engines and private launch vehicles for small satellites. Additionally, other startups are focusing on high-resolution Earth imaging and advanced in-space propulsion systems. These domestic ventures are playing an increasingly important role in the nation's space sector, driving innovation and commercial growth.

148. (D) Netra Airborne Early Warning and Control (AEW&C) System
Providing battlefield transparency is critical for modern military operations. Systems like the Netra AEW&C use advanced radar and sensors to monitor large areas, detecting enemy aircraft and troop movements from a distance. This real-time intelligence allows field commanders to make informed decisions and coordinate responses effectively. Such systems are essential for maintaining situational awareness and ensuring a strategic advantage in combat scenarios.

149. (D) V only
The training for India's first human spaceflight mission involves a comprehensive program to prepare the crew for the challenges of space. Candidates are selected from experienced pilots and undergo training in areas like physiology, mission systems, and survival techniques. Precursor missions using robotic humanoids will also be conducted to test all systems. These efforts are focused on the success of the domestic mission.

NODIA

150. (A) Both A and R are true and R is the correct explanation of A.
NavIC utilizes dual-frequency signals to provide more accurate positioning services to users. By transmitting on two different bands, the system can correct for delays caused by the Earth's ionosphere, which is a major source of error in satellite navigation. This capability ensures that the system provides high-precision data, which is essential for both civilian applications and the strategic needs of the country.

151. (A) Sensor image capture, Onboard processing, Downlink to ground station, Data dissemination to users
An Earth observation satellite follows a clear operational path to provide data to users. It begins by capturing images of the surface using specialized sensors. This data is then processed onboard before being transmitted back to a ground station via a downlink. Finally, the information is distributed to researchers, government agencies, and other users for various environmental and strategic applications.

152. (D) Ground control station antennas
Space debris poses a significant threat to operational satellites in orbit. Large solar panels and sensitive optical lenses are particularly vulnerable to high-speed impacts from fragments. Even communication antennas on the spacecraft can be damaged. However, ground-based infrastructure, such as control station antennas, is protected by the Earth's atmosphere and is not directly affected by the physical presence of debris in orbit.

153. (A) P-I, Q-II, R-III, S-IV
India's military platforms reflect a diverse range of international collaborations and acquisitions. These include massive warships of Russian origin and advanced fighter jets from France. Additionally, heavy-lift transport aircraft from the United States and sophisticated early warning systems from Israel provide critical capabilities. These various sources ensure that the armed

103. (A) High-resolution cameras used for cartography and urban planning.
The Cartosat series is a specialized group of Earth observation satellites designed for high-resolution imaging. Their primary purpose is to provide detailed data for cartography, urban planning, and coastal land use monitoring. These satellites use advanced optical cameras to capture clear images of the Earth's surface, supporting both civilian infrastructure projects and the strategic monitoring of national borders and geographic features.

104. (B) I, III and IV
India's missile arsenal includes diverse systems for different strategic and tactical needs. The Agni-V provides intercontinental ballistic capabilities with solid fuel, while the Astra is a specialized air-to-air missile for aerial combat. Additionally, the Nag is a powerful anti-tank weapon that operates on a fire-and-forget principle. These indigenous systems collectively ensure a robust and multi-layered defense for the nation.

105. (B) Subsonic Cruise Missile
Nirbhay is a long-range subsonic cruise missile designed to carry various warheads and strike targets with high precision. It is capable of flying at very low altitudes, allowing it to avoid detection by enemy radar systems. Its ability to loiter and maneuver during flight makes it a versatile addition to the military's strike capabilities, providing a reliable option for modern tactical operations.

106. (A) Both A and R are true and R is the correct explanation of A.
The establishment of the Defence Space Agency highlights the growing importance of outer space in national security. This agency is responsible for managing the country's space-based assets and protecting them from emerging threats like anti-satellite weapons and cyber-attacks. By centralizing the management of space capabilities, the agency ensures that the armed forces can effectively utilize satellite data for various defense operations.

107. (A) P-III, Q-IV, R-I, S-II
India has developed a range of indigenous helicopters to fulfill various military requirements. The Dhruv is a versatile advanced light helicopter used for multi-role missions, while the Prachand is specifically designed for combat in high-altitude environments. Additionally, newer utility helicopters are being developed to replace aging fleets, ensuring that the armed forces have modern and reliable aerial support for diverse operations.

108. (A) Meteorological Observation and Weather Forecasting
The INSAT-3D and 3DR satellites are dedicated meteorological observatories that provide vital data for weather forecasting and disaster warning. Equipped with advanced imaging and sounding instruments, they monitor atmospheric conditions, sea surface temperatures, and cloud movements. This information is essential for predicting cyclones and other extreme weather events, helping to protect lives and infrastructure across the entire Indian subcontinent and surrounding regions.

109. (D) V only
The Gaganyaan crew module is a sophisticated spacecraft designed to keep astronauts safe during their mission. It includes advanced life support systems, thermal protection for re-entry, and a parachute system for a controlled splashdown in the ocean. While it is a key step toward establishing a future space station, the module itself is designed for short-duration orbital missions rather than permanent habitation.

110. (A) Both A and R are true and R is the correct explanation of A.
Remote sensing satellites are typically placed in Sun-synchronous polar orbits to ensure consistent lighting for Earth observation. By passing over any given point at the same local solar time, the satellite can capture images with similar shadow patterns and illumination. This consistency is vital for accurately comparing data over time, which is essential for applications like agricultural monitoring and environmental change detection.

111. (B) Solid Booster Stage, Liquid Propellant Stage, Cryogenic Upper Stage
A typical heavy-lift rocket launch follows a specific sequence of stages to reach orbit. It begins with the ignition of powerful solid boosters that provide the initial thrust needed for lift-off. This

Click Here to Buy book on Amazon

CHAPTER 12

Environment, Ecology, Current Science and Technology

1. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): The Nilgiri Biosphere Reserve is a crucial ecological zone in the Western Ghats known for its high endemism.
Reason (R): It encompasses varied ecosystems ranging from tropical evergreen forests to montane sholas and dry deciduous forests.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

2. Match the Biogeochemical cycles in List I with their predominant nature in List II.
List I: (Biogeochemical cycles)
P. Carbon Cycle
Q. Phosphorus Cycle
R. Water Cycle
S. Nitrogen Cycle
List II: (Predominant nature)
I. Sedimentary cycle
II. Gaseous cycle driven by bacteria
III. Global gaseous cycle
IV. Hydrological cycle
(A) P-III, Q-I, R-IV, S-II
(B) P-I, Q-III, R-II, S-IV
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

3. Identify the incorrectly matched pair regarding Tamil Nadu's Tiger Reserves.
(A) Mudumalai - Theni
(B) Kalakkad Mundanthurai - Tirunelveli and Kanyakumari
(C) Sathyamangalam - Erode
(D) Anamalai - Coimbatore and Tiruppur
(E) Answer not known

4. Consider the following statements regarding the components of an ecosystem:
I. Abiotic factors include sunlight, temperature, and soil pH.
II. Biotic components are exclusively made up of primary producers.
III. Decomposers play a vital role in recycling nutrients back into the abiotic environment.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II only
(D) III only
(E) Answer not known

5. Consider the following statements regarding food webs and energy flow:
I. A food web is a network of interconnected food chains.
II. Energy flow in an ecosystem is always bidirectional.
III. The Ten Percent Law was proposed by Raymond Lindeman.
IV. Autotrophs form the base of ecological pyramids.
V. Saprotrophs occupy the first trophic level.
Which of the above statement(s) is/are correct?
(A) I, III, IV and V
(B) I, II and IV
(C) I, III and IV
(D) II, III, IV and V
(E) Answer not known

6. Arrange the following levels of ecological organisation in the correct ascending order (from smallest to largest):
I. Population
II. Biosphere
III. Organism

Downloaded from www.pdf.tube

IV. Ecosystem
V. Community
(A) III, I, V, IV, II
(B) III, V, I, IV, II
(C) I, III, V, IV, II
(D) III, I, IV, V, II
(E) Answer not known

7. What is the fundamental definition of ecology?
(A) The study of cellular structures and internal physiological processes within flora and fauna.
(B) The study of interactions between organisms and their environment.
(C) The mapping of genetic codes to aid the conservation of specific endangered species.
(D) The analysis of global weather patterns and variations in long-term climatic conditions.
(E) Answer not known

8. According to the ten percent law of energy transfer in ecosystems, what happens to the remaining ninety percent of the energy?
(A) It is destroyed completely in the biological system.
(B) It is stored permanently in the soil for plants.
(C) It is utilized for life processes and lost as heat.
(D) It is transferred back directly to the sun.
(E) Answer not known

9. Which of the following is a completely abiotic factor in a terrestrial ecosystem?
(A) Humus
(B) Soil microbes
(C) Fallen leaves
(D) Sunlight
(E) Answer not known

10. Identify the correct statement regarding trophic levels in an ecosystem.
(A) Primary producers occupy the first trophic level.
(B) Primary consumers belong to the first trophic level.
(C) Carnivores that eat herbivores belong to the second trophic level.
(D) Apex predators face the highest concentration of energy availability.
(E) Answer not known

11. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): The Western Ghats are classified as one of the biodiversity hotspots in India.
Reason (R): They experience high levels of habitat loss but contain very few endemic species.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

12. Match the National Parks / Sanctuaries in List I with their primary conservation focus in List II.
List I: (National Parks / Sanctuaries)
P. Gulf of Mannar Marine National Park
Q. Guindy National Park
R. Mukurthi National Park
S. Point Calimere Wildlife Sanctuary
List II: (Conservation Focus)
I. Nilgiri Tahr
II. Blackbuck
III. Dugong
IV. Migratory Birds
(A) P-III, Q-II, R-I, S-IV
(B) P-II, Q-III, R-IV, S-I
(C) P-III, Q-I, R-II, S-IV
(D) P-I, Q-IV, R-III, S-II
(E) Answer not known

13. Which of the following pairs concerning threats to biodiversity is correctly matched?
(A) Habitat fragmentation - Division of continuous habitats into smaller patches
(B) Poaching - Legal trading of wild animal species
(C) Invasive species - Native species that enhance local biodiversity
(D) Co-extinction - Survival of a species due to the extinction of its predator
(E) Answer not known

NODIA

14. Consider the following statements about biodiversity conservation methods:
I. In-situ conservation involves protecting endangered species in their natural habitat.
II. Zoological parks and botanical gardens are examples of in-situ conservation.

III. Ex-situ conservation includes seed banks and cryopreservation.
IV. Biosphere reserves are a form of ex-situ conservation.
Which of the above statement(s) is/are incorrect?
(A) I, II and III
(B) II and IV
(C) I, III and IV
(D) I and III
(E) Answer not known

15. Select the correct order of energy flow in a standard grazing food chain.
(A) Producers → Secondary Consumers → Primary Consumers → Tertiary Consumers
(B) Primary Consumers → Producers → Secondary Consumers → Decomposers
(C) Producers → Primary Consumers → Secondary Consumers → Tertiary Consumers
(D) Decomposers → Producers → Tertiary Consumers → Secondary Consumers
(E) Answer not known

16. Identify the incorrect statement regarding the types of biodiversity.
(A) Genetic biodiversity involves the variation of genes within a particular species population.
(B) Species biodiversity involves the variety of different species found within a given region.
(C) Alpha diversity measures the total biodiversity across a large-scale geographical area.
(D) Ecosystem biodiversity involves the diversity of ecological processes throughout the biosphere.
(E) Answer not known

17. Which of the following is NOT an example of ex-situ conservation?
(A) Botanical Gardens
(B) Sacred Groves
(C) Gene Banks
(D) Zoological Parks
(E) Answer not known

18. Which of the following terms is most appropriate for a species whose addition to or loss from an ecosystem leads to major changes in the abundance or occurrence of at least one other species?
(A) Endemic species
(B) Exotic species
(C) Flagship species
(D) Keystone species
(E) Answer not known

19. If a persistent pesticide enters an aquatic ecosystem, which organism will exhibit the highest concentration of the chemical due to biomagnification?
(A) Fish-eating birds
(B) Phytoplankton
(C) Zooplankton
(D) Small plankton-eating fishes
(E) Answer not known

20. Species that are found only in a particular, restricted geographical area and nowhere else in the world are classified as:
(A) Cosmopolitan species
(B) Extinct in the wild
(C) Endemic species
(D) Invasive alien species
(E) Answer not known

21. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): The Air Quality Index (AQI) translates complex air quality data into a single number, colour, and category.
Reason (R): It helps the general public easily understand the potential health impacts of local air pollution levels.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

22. Match the air pollutants in List I with their major health/environmental effects in List II.
List I: (Air Pollutants)
P. Carbon Monoxide
Q. Sulphur Dioxide
R. Chlorofluorocarbons
S. Particulate Matter 2.5
List II: (Effects)

Click Here to Buy book on Amazon

leads to which environmental consequence downstream?
(A) A significant increase in the total storage depth of local water reservoirs.
(B) Siltation of reservoirs leading to a decrease in hydroelectric power capacity.
(C) Siltation of reservoirs and reduction in hydroelectric power capacity.
(D) A measurable decrease in the frequency and intensity of flash flood events.
(E) Answer not known

37. What is the primary advantage of utilizing bioremediation over traditional chemical methods for soil cleanup?
(A) It is generally more cost-effective and environmentally friendly.
(B) It requires extensive excavation and transportation of soil.
(C) It is a highly energy-intensive process yielding immediate results.
(D) It introduces highly reactive synthetic chemicals into the ecosystem.
(E) Answer not known

38. Which of the following defines E-waste as per environmental management rules?
(A) Wastewater that is discharged specifically from electronic manufacturing industries.
(B) Gaseous emissions produced during the industrial smelting of electronic components.
(C) Biodegradable packaging materials used for the transport of electronic devices.
(D) Discarded electrical equipment including all of its components and spare parts.
(E) Answer not known

39. According to the Central Pollution Control Board (CPCB), what is the permissible noise level limit for residential areas during daytime?
(A) 75 dB(A)
(B) 65 dB(A)
(C) 55 dB(A)
(D) 45 dB(A)
(E) Answer not known

40. The catastrophic nuclear accident that occurred in 1986, which severely influenced global radioactive waste disposal norms, took place in:
(A) Fukushima
(B) Three Mile Island
(C) Chernobyl
(D) Kyshtym
(E) Answer not known

NODIA

41. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): The Montreal Protocol is considered one of the most successful international environmental treaties.
Reason (R): It successfully facilitated the global phase-out of ozone-depleting substances, leading to the recovery of the ozone layer.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

42. Match the greenhouse gases in List I with their major anthropogenic sources in List II.
List I: (Greenhouse Gases)
P. Carbon Dioxide
Q. Methane
R. Nitrous Oxide
S. Hydrofluorocarbons
List II: (Anthropogenic Sources)
I. Paddy fields and livestock
II. Fossil fuel combustion
III. Refrigerants and air conditioning
IV. Agricultural fertilizers
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-I, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

43. Identify the correctly matched pair regarding plastic pollution.
(A) Secondary microplastics - Microbes that naturally consume various plastic polymers.
(B) Primary microplastics - Intentionally manufactured tiny plastic particles.
(C) Macroplastics - Plastic polymers that dissolve entirely when exposed to seawater.
(D) Single-use plastics - Plastics designed specifically for several decades of reuse.
(E) Answer not known

(E) Answer not known

29. Which of the following is an example of a secondary air pollutant?
(A) Peroxyacetyl nitrate (PAN)
(B) Sulphur dioxide gas
(C) Carbon monoxide gas
(D) Lead particulates
(E) Answer not known

30. Which of the following gases has the most significant contribution to the natural greenhouse effect?
(A) Methane
(B) Nitrous Oxide
(C) Water Vapour
(D) Chlorofluorocarbons
(E) Answer not known

31. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): Chronic exposure to noise levels above 85 decibels (dB) can lead to noise-induced hearing loss.
Reason (R): High-intensity sound waves cause permanent damage to the hair cells in the cochlea of the inner ear.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

32. Match the soil remediation methods in List I with their mechanisms in List II.
List I: (Remediation Methods)
P. Phytoremediation
Q. Bioventing
R. Soil Washing
S. Thermal Desorption
List II: (Mechanisms)
I. Using heat to vaporize contaminants
II. Using plants to absorb or breakdown pollutants
III. Supplying air to stimulate indigenous microbes
IV. Scrubbing soil with water or solvents
(A) P-II, Q-III, R-IV, S-I
(B) P-III, Q-II, R-I, S-IV
(C) P-II, Q-IV, R-III, S-I
(D) P-I, Q-III, R-IV, S-II
(E) Answer not known

33. Identify the incorrectly matched pair regarding radioactive isotopes and their impacts.
(A) Iodine-131 - Association with thyroid cancer.
(B) Uranium-235 - Ozone layer depletion catalyst.
(C) Strontium-90 - Association with bone cancer.
(D) Cesium-137 - Severe gastrointestinal damage.
(E) Answer not known

34. Consider the following statements about radioactive pollution and management in Tamil Nadu:
I. The Kudankulam Nuclear Power Plant utilizes Pressurised Heavy Water Reactors (PHWR).
II. Safe disposal of high-level radioactive waste requires deep geological repositories.
III. Radioactive pollution can cause genetic mutations across generations.
IV. Background radiation from natural sources is entirely absent in Tamil Nadu.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) II and III
(C) I, III and IV
(D) I and IV
(E) Answer not known

35. Select the correct sequence that depicts the process of biomagnification of a toxic substance in an aquatic food chain.
(A) Water → Zooplankton → Small Fish → Large Fish → Fish-eating birds
(B) Fish-eating birds → Large Fish → Small Fish → Zooplankton → Water
(C) Water → Large Fish → Small Fish → Zooplankton → Fish-eating birds
(D) Zooplankton → Water → Fish-eating birds → Small Fish → Large Fish
(E) Answer not known

36. Increased soil erosion in the hilly regions of Tamil Nadu, such as the Nilgiris, most directly

Downloaded from www.pdf.tube

weather events.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

52. Match the renewable energy sources in List I with their notable project locations/features in India in List II.
List I: (Renewable Energy)
P. Solar Energy
Q. Wind Energy
R. Geothermal Energy
S. Tidal Energy
List II: (Locations/Features)
I. Kamuthi, Tamil Nadu
II. Muppandal, Tamil Nadu
III. Puga Valley, Ladakh
IV. Gulf of Kutch, Gujarat
(A) P-I, Q-II, R-III, S-IV
(B) P-II, Q-I, R-IV, S-III
(C) P-III, Q-IV, R-I, S-II
(D) P-I, Q-III, R-II, S-IV
(E) Answer not known

53. Identify the incorrectly matched pair regarding renewable energy schemes in India.
(A) Rooftop Solar Scheme - Installing wind turbines on residential roofs
(B) PM-KUSUM - Subsidizing agricultural solar pumps
(C) National Solar Mission - Achieving 100 GW solar capacity initially by 2022
(D) National Hydrogen Mission - Producing green hydrogen using renewable energy
(E) Answer not known

54. Consider the following statements about India's Nationally Determined Contributions (NDCs):
I. India committed to reducing the emissions intensity of its GDP.
II. India committed to achieving 50% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030.
III. India committed to creating an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent.
IV. India committed to achieving Net Zero emissions by 2030.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I and III
(E) Answer not known

55. Select the correct option showing states with the highest wind energy potential in India due to their long coastlines and geographic positioning.
(A) Uttar Pradesh, Bihar, Jharkhand
(B) Tamil Nadu, Gujarat, Maharashtra
(C) Punjab, Haryana, Uttarakhand
(D) Assam, Meghalaya, Tripura
(E) Answer not known

56. Geothermal energy generation utilizes which of the following natural phenomena?
(A) The gravitational pull of the moon on the oceans
(B) The flow of surface water in mountainous terrains
(C) Heat derived from the Earth's internal geological processes
(D) The conversion of solar radiation into direct electrical current
(E) Answer not known

NODIA

57. Which of the following energy sources is classified as non-renewable due to its finite nature and geological timescale for formation?
(A) Biomass
(B) Offshore Wind
(C) Small Hydro
(D) Natural Gas
(E) Answer not known

58. When comparing solar energy and wind energy production in Tamil Nadu, which of the following is true?
(A) Wind energy is the largest part of Tamil Nadu's installed renewable capacity.
(B) Solar energy production is viable twenty-four hours a day, unlike wind energy.
(C) Tamil Nadu has phased out solar energy to focus strictly on offshore wind power.
(D) Solar panels in Tamil Nadu generate their peak power during the monsoon season.
(E) Answer not known

44. Consider the following statements about the 'Meendum Manjappai' campaign in Tamil Nadu:
I. It aims to eliminate the use of single-use plastic bags.
II. It promotes the revival of traditional yellow cloth bags.
III. It encourages the use of disposable paper bags lined with microplastics.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II only
(D) III only
(E) Answer not known

45. Consider the following statements regarding ozone layer depletion:
I. The ozone layer is primarily found in the troposphere.
II. Dobson Units (DU) are used to measure the thickness of the ozone layer.
III. Ultraviolet-B (UV-B) radiation increases due to ozone depletion.
IV. Chlorofluorocarbons release active chlorine atoms under UV light.
V. The Antarctic ozone hole is most prominent during its spring season.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, III, IV and V
(D) II, IV and V
(E) Answer not known

46. Arrange the following greenhouse gases in descending order of their Global Warming Potential (GWP) over a 100-year time horizon:
I. Carbon Dioxide
II. Methane
III. Nitrous Oxide
IV. Sulphur Hexafluoride
(A) IV, III, II, I
(B) IV, II, III, I
(C) I, II, III, IV
(D) III, IV, II, I
(E) Answer not known

47. Which of the following statements correctly describes a mandate under the nationwide ban on Single-Use Plastics (SUP) that came into effect in India in July 2022?
(A) It banned all forms of multi-layered packaging used for the storage of food items.
(B) It allowed the sale of plastic earbuds and balloon sticks if produced locally.
(C) It only prohibited plastic carrier bags with a thickness of less than 20 microns.
(D) It prohibited the manufacturing, sale, and distribution of specified SUP items.
(E) Answer not known

48. Identify the incorrect statement regarding the Paris Agreement on climate change.
(A) It is a legally binding international treaty on climate change.
(B) It aims to limit global warming to well below 2 degrees Celsius compared to pre-industrial levels.
(C) It mandates that all developed nations completely halt industrial activities by 2030.
(D) It works on a five-year cycle of increasingly ambitious climate action.
(E) Answer not known

49. Which of the following atmospheric gases is an exception and does NOT act as a greenhouse gas?
(A) Methane (CH_4)
(B) Nitrogen (N_2)
(C) Water Vapour (H_2O)
(D) Carbon Dioxide (CO_2)
(E) Answer not known

50. Which of the following international reports is most appropriate to consult for comprehensive scientific assessments on climate change, its implications, and potential future risks?
(A) IUCN Red List
(B) CITES Appendices
(C) UNEP Frontiers Report
(D) IPCC Assessment Reports
(E) Answer not known

51. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): Tamil Nadu became the first state in India to launch its own Climate Change Mission.
Reason (R): The state is highly vulnerable to sea-level rise, erratic monsoons, and extreme

Click Here to Buy book on Amazon

I. Acid Rain
II. Reduces oxygen-carrying capacity of blood
III. Penetrates deep into the lungs
IV. Ozone layer depletion
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-I, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

23. Identify the correctly matched pair regarding water pollution.
(A) Minamata Disease - Result of chronic cadmium poisoning through contaminated water sources.
(B) Eutrophication - The enrichment of a water body with excess biological nutrients.
(C) Itai-Itai Disease - Result of severe mercury poisoning through contaminated water sources.
(D) Blue Baby Syndrome - Condition caused by excessive fluoride levels in local drinking water.
(E) Answer not known

24. Consider the following statements regarding the Water (Prevention and Control of Pollution) Act:
I. It was enacted in the year 1974.
II. It paved the way for the creation of the Central Pollution Control Board (CPCB).
III. It primarily regulates noise pollution limits in urban areas.
Which of the above statement(s) is/are correct?
(A) I and III
(B) I and II
(C) II and III
(D) III only
(E) Answer not known

25. Consider the following statements about Eutrophication:
I. It is caused by the runoff of agricultural fertilizers containing nitrates and phosphates.
II. It leads to algal blooms which deplete the dissolved oxygen in the water.
III. It enhances the survival rate of benthic fishes.
IV. It ultimately accelerates the aging process of a lake.
V. It is exclusively a natural process with no human influence.
Which of the above statement(s) is/are incorrect?
(A) I, II and IV
(B) III and V
(C) I, III, IV and V
(D) II, IV and V
(E) Answer not known

26. Arrange the following Air Quality Index (AQI) categories in the correct ascending order of their pollution severity:
I. Very Poor
II. Satisfactory
III. Severe
IV. Moderate
V. Good
(A) V, II, IV, I, III
(B) V, IV, II, I, III
(C) II, V, IV, III, I
(D) V, II, I, IV, III
(E) Answer not known

27. When comparing Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) in wastewater testing, which statement is true?
(A) BOD values are consistently higher than COD values for any specific wastewater sample.
(B) COD measures both biodegradable and non-biodegradable organic matter in the water.
(C) BOD is a significantly faster biological test to perform when compared to the COD test.
(D) High BOD indicate relatively low levels of organic pollution within the tested water body.
(E) Answer not known

28. Which of the following features best describes Photochemical Smog?
(A) It occurs primarily during cold winter months in environments with damp and foggy climates.
(B) It is formed by sunlight reacting with nitrogen oxides and volatile organic compounds.
(C) It is synonymous with industrial London Smog caused by burning large amounts of coal.
(D) It is a beneficial layer that creates localized ozone to protect urban areas from UV rays.

NODIA

59. A key feature of India's National Solar Mission (NSM) is:
(A) It focuses on importing solar panels and discourages any local solar manufacturing.
(B) It aims to make India a global leader in solar energy through policy diffusion.
(C) It mandates the use of solar energy for every public transport vehicle by 2025.
(D) It strictly restricts private sector participation in large utility-scale projects.
(E) Answer not known

60. An example of harnessing energy from the predictable rise and fall of sea levels caused by gravitational forces is:
(A) Ocean Thermal Energy Conversion
(B) Tidal Energy
(C) Offshore Wind Energy
(D) Wave Energy
(E) Answer not known

61. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): The National Green Tribunal (NGT) was established in 2010 to ensure expeditious disposal of cases relating to environmental protection.
Reason (R): The NGT is not bound by the procedure laid down under the Code of Civil Procedure, 1908, but is guided by principles of natural justice.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

62. Match the Environmental Legislations in List I with their year of enactment in List II.
List I: (Environmental Legislations)
P. Wildlife Protection Act
Q. Forest Conservation Act
R. Environment Protection Act
S. Biological Diversity Act
List II: (Year of Enactment)
I. 1980
II. 1972
III. 2002
IV. 1986
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-II, S-I
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

63. Identify the incorrectly matched pair regarding the steps of the Environmental Impact Assessment (EIA) process.
(A) Screening - Determining if a project requires a full EIA
(B) Scoping - Deciding the terms of reference and identifying key issues
(C) Appraisal - Detailed scrutiny by the Expert Appraisal Committee
(D) Public Hearing - Seeking clearance from international environmental agencies
(E) Answer not known

64. Consider the following statements about the Forest (Conservation) Act, 1980:
I. It restricts the state governments from de-reserving a reserve forest without central approval.
II. It allows the unregulated diversion of forest land for non-forest purposes like mining.
III. It aims to check further deforestation and conserve the ecological balance.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II and III
(D) III only
(E) Answer not known

65. Consider the following statements about the Environment (Protection) Act, 1986:
I. It was enacted in the wake of the Bhopal Gas Tragedy.
II. It acts as an umbrella legislation designed to provide a framework for central coordination.
III. It empowers the Central Government to establish authorities for pollution control.
IV. It strictly prohibits citizen participation in environmental conservation.
V. Eco-Sensitive Zones (ESZ) are declared under this Act.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V

NODIA

(C) I, III, IV and V
(D) I, II and IV
(E) Answer not known

66. Arrange the following steps of the Environmental Impact Assessment (EIA) process in their correct chronological order:
I. Preparation of draft EIA report
II. Scoping
III. Screening
IV. Appraisal
V. Public Consultation
(A) III, II, I, V, IV
(B) II, III, I, V, IV
(C) III, I, II, V, IV
(D) III, II, V, I, IV
(E) Answer not known

67. The time limit for filing an appeal before the National Green Tribunal (NGT) against an order or decision is generally:
(A) 30 days from the date of the order
(B) 90 days from the date of the order
(C) 120 days from the date of the order
(D) 180 days from the date of the order
(E) Answer not known

68. What can be inferred from the mandatory requirement of post-environmental clearance monitoring in India?
(A) It implies that every environmental clearance is a temporary permit valid for one year.
(B) It allows the government to automatically seize private projects after their completion.
(C) It ensures that the proponent complies with the stipulated mitigation measures.
(D) It proves that initial EIA reports are always flawed and require constant corrections.
(E) Answer not known

69. A major advantage of the public consultation phase in the EIA process is:
(A) It allows local communities to express concerns regarding specific project impacts.
(B) It bypasses the requirement for scientific data collection by environmental experts.
(C) It ensures absolute approval of developmental projects regardless of ecological impact.
(D) It significantly reduces the total financial cost of conducting the entire EIA process.
(E) Answer not known

70. Sustainable Development is fundamentally defined as:
(A) Development that maximizes industrial output without considering resource depletion.
(B) Development that stops all economic activities to preserve the natural environment.
(C) Development focused on poverty eradication regardless of any future ecological cost.
(D) Development that meets current needs without compromising future generations' needs.
(E) Answer not known

71. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): India's localized approach to the Sustainable Development Goals (SDGs) ensures better implementation at the grassroots level.
Reason (R): NITI Aayog monitors SDG progress at the state and union territory levels through the SDG India Index.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

72. Match the Sustainable Development Goals (SDGs) in List I with their specific themes in List II.
List I: (SDGs)
P. SDG 6
Q. SDG 7
R. SDG 13
S. SDG 15
List II: (Themes)
I. Climate Action
II. Life on Land
III. Clean Water and Sanitation
IV. Affordable and Clean Energy
(A) P-III, Q-IV, R-I, S-II
(B) P-IV, Q-III, R-II, S-I
(C) P-III, Q-II, R-I, S-IV
(D) P-I, Q-IV, R-III, S-II

Downloaded from www.pdf.tube

(E) Answer not known

73. Identify the correctly matched pair regarding India's Science, Technology, and Innovation policies.
(A) Scientific Policy Resolution 1958 - Focused solely on the task of space exploration.
(B) Science and Technology Policy 2003 - Aimed strictly at dismantling the entire DRDO.
(C) STIP 2020 - Designed to completely privatize every level of higher education in India.
(D) Technology Policy Statement 1983 - Emphasized self-reliance and indigenous technology.
(E) Answer not known

74. Consider the following statements regarding the performance of Tamil Nadu in the SDG India Index:
I. Tamil Nadu consistently ranks among the top-performing states.
II. High performance in SDG 1 (No Poverty) and SDG 3 (Good Health and Well-being) drives its ranking.
III. Tamil Nadu is classified as an 'Aspirant' state in the overall index.
IV. The state has integrated SDG targets into its annual budgetary framework.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I and IV
(E) Answer not known

75. Select the correct sequence of the first four Sustainable Development Goals (SDGs).
(A) Zero Hunger, No Poverty, Quality Education, Good Health
(B) No Poverty, Zero Hunger, Good Health and Well-being, Quality Education
(C) Good Health, Zero Hunger, Quality Education, Gender Equality
(D) No Poverty, Quality Education, Clean Water, Zero Hunger
(E) Answer not known

76. The concept of Sustainable Development was first formalized globally in 1987 through which of the following landmark reports?
(A) The Club of Rome Report (Limits to Growth)
(B) The Brundtland Report (Our Common Future)
(C) The Kyoto Protocol Report
(D) The Rio Declaration on Environment
(E) Answer not known

77. The United Nations General Assembly adopted the 2030 Agenda for Sustainable Development, which includes 17 SDGs, in the year:
(A) 2000
(B) 2010
(C) 2012
(D) 2015
(E) Answer not known

78. Which statement best describes India's current innovation ecosystem as promoted by the Science, Technology, and Innovation Policy (STIP) 2020?
(A) It encourages a highly centralized research model that is restricted to government labs.
(B) It discourages private sector funding in R&D in order to maintain a public monopoly.
(C) It promotes a decentralized, inclusive, and bottom-up approach to Indian open science.
(D) It limits all international collaboration regarding important technological advancements.
(E) Answer not known

79. Identify the incorrect statement regarding the NITI Aayog SDG India Index.
(A) It ranks States and Union Territories based on their performance across 16 SDGs.
(B) It categorizes states into Aspirant, Performer, Front Runner, and Achiever.
(C) The score ranges between 0 and 100.
(D) The index is compiled strictly by the World Bank without domestic data.
(E) Answer not known

NODIA

80. Which of the following is NOT one of the 17 Sustainable Development Goals?
(A) Reduced Inequalities
(B) Peace, Justice and Strong Institutions
(C) Promotion of Space Tourism
(D) Decent Work and Economic Growth
(E) Answer not known

81. The following question consists of an Assertion (A) and a Reason (R).

Assertion (A): Deep Learning is a subset of Machine Learning that uses artificial neural networks with multiple layers.
Reason (R): These multiple layers allow the system to learn complex patterns from large amounts of unstructured data without human intervention.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

82. Match the Artificial Intelligence concepts in List I with their descriptions in List II.
List I: (AI Concepts)
P. Artificial Narrow Intelligence (ANI)
Q. Artificial General Intelligence (AGI)
R. Machine Learning
S. Natural Language Processing
List II: (Descriptions)
I. Algorithms that learn from data to make predictions
II. AI specialized in one specific task
III. Interacting with computers using human language
IV. AI with human-level cognitive capabilities
(A) P-II, Q-IV, R-I, S-III
(B) P-IV, Q-II, R-III, S-I
(C) P-II, Q-I, R-IV, S-III
(D) P-I, Q-IV, R-II, S-III
(E) Answer not known

83. Identify the incorrectly matched pair regarding the applications of AI.
(A) Deepfakes - Enhancing data privacy and cybersecurity
(B) Healthcare - Early detection of diseases using medical imaging
(C) Agriculture - Precision farming and crop disease prediction
(D) Finance - Algorithmic trading and fraud detection
(E) Answer not known

84. Consider the following ethical concerns related to Artificial Intelligence:
I. Algorithmic bias leading to discriminatory outcomes.
II. Lack of transparency in decision-making processes (Black Box problem).
III. Complete elimination of carbon footprints in data centers.
Which of the above statement(s) is/are correct?
(A) I and III
(B) I and II
(C) II and III
(D) II only
(E) Answer not known

85. Consider the following statements about Deep Learning:
I. It is inspired by the structure and function of the human brain.
II. It requires large volumes of data for effective training.
III. It performs well on unstructured data like images and audio.
IV. It relies on a single-layer neural network to process information.
V. Convolutional Neural Networks (CNNs) are widely used for image recognition.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, III, IV and V
(D) I, II and IV
(E) Answer not known

86. Arrange the following technological paradigms in the chronological sequence of their conceptual development and mainstream adoption:
I. Generative AI
II. Artificial Intelligence
III. Machine Learning
IV. Deep Learning
(A) II, III, IV, I
(B) III, II, I, IV
(C) II, IV, III, I
(D) III, IV, II, I
(E) Answer not known

87. The term used for AI-generated synthetic media that convincingly replaces a person's likeness in a video with someone else's, raising significant ethical and security concerns, is:
(A) Augmented Reality
(B) Deepfake
(C) Holographic Projection
(D) Cryptography

Click Here to Buy book on Amazon

(E) Answer not known

88. Generative AI models like ChatGPT function primarily by:
(A) Retrieving exact answers from a static database without any contextual alteration.
(B) Translating binary code strings into specific hardware execution commands.
(C) Analyzing statistical patterns in large datasets to generate human-like text.
(D) Manually connecting users to human experts for the provision of real-time answers.
(E) Answer not known

89. In Machine Learning, training a model on a dataset that contains input data with corresponding output labels is classified as:
(A) Unsupervised Learning
(B) Reinforcement Learning
(C) Semi-supervised Learning
(D) Supervised Learning
(E) Answer not known

90. When comparing the traditional manual file processing system with the AI-driven 'e-Paarvai' initiative (for cataract detection) in Tamil Nadu, a key difference is that AI provides:
(A) Rapid, scalable screening using smartphone-based image analysis.
(B) A hundred percent guarantee of curing the disease without any surgery.
(C) Slower but more personalized manual diagnostics for individual patients.
(D) A complete replacement of all trained ophthalmologists working in the state.
(E) Answer not known

91. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): Blockchain technology is considered highly secure and tamper-evident.
Reason (R): Data in a blockchain is stored in decentralized blocks, and altering any block requires changing all subsequent blocks across the network.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

92. Match the Blockchain concepts in List I with their functions in List II.
List I: (Blockchain Concepts)
P. Cryptography
Q. Smart Contract
R. Ledger
S. Consensus Mechanism
List II: (Functions)
I. Self-executing code when conditions are met
II. Secures data and verifies transactions
III. Method for nodes to agree on validity
IV. The record of all transactions
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-II, S-I
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

93. Identify the correctly matched pair regarding the Internet of Things (IoT).
(A) Edge Computing - Processing data closer to where it is generated.
(B) Actuator - Senses environmental changes such as temperature or humidity.
(C) Sensor - Converts electrical signals into specific physical mechanical action.
(D) Cloud Storage - A local, offline hard drive used for individual IoT devices.
(E) Answer not known

94. Consider the following statements regarding 'Nambikkai Inaiyam', Tamil Nadu's State Blockchain Backbone:
I. It aims to secure government data and documents against tampering.
II. It facilitates the issuance of verifiable electronic certificates to citizens.
III. It completely replaces the traditional physical currency system in the state with cryptocurrency.
IV. It is a part of Tamil Nadu's e-governance initiatives.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) II, III and IV
(D) I and II

NODIA

125. Consider the following statements regarding the NISAR mission:
I. It is a joint mission between ISRO and NASA.
II. It will map the entire globe in 12 days to study Earth's ecosystems.
III. It will measure changes in ice sheets and glaciers.
IV. It uses L-band and S-band Synthetic Aperture Radar.
V. It is primarily designed for deep space asteroid mining.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) II, III, IV and V
(C) I, III, IV and V
(D) I, II and V
(E) Answer not known

126. Arrange the following ISRO launch vehicles in the chronological order of their historical development and operational use:
I. SLV (Satellite Launch Vehicle)
II. GSLV (Geosynchronous Satellite Launch Vehicle)
III. ASLV (Augmented Satellite Launch Vehicle)
IV. PSLV (Polar Satellite Launch Vehicle)
(A) I, III, IV, II
(B) I, IV, III, II
(C) III, I, IV, II
(D) I, III, II, IV
(E) Answer not known

127. When comparing PSLV and GSLV, which of the following is true?
(A) PSLV is mainly used for placing heavy communication satellites into geostationary orbits.
(B) PSLV uses only liquid propulsion stages.
(C) GSLV is designed exclusively for low earth orbit earth observation missions.
(D) GSLV utilizes a cryogenic upper stage for lifting heavier payloads.
(E) Answer not known

128. What is the defining feature of the Small Satellite Launch Vehicle (SSLV) developed by ISRO?
(A) It is designed to carry human astronauts to the International Space Station.
(B) It is the heaviest satellite launch vehicle ever built by the nation of India.
(C) It offers 'launch on demand' flexibility for small satellites.
(D) It uses a completely nuclear-powered propulsion system for its engines.
(E) Answer not known

129. The L1 point, where the Aditya L1 spacecraft is positioned, is an example of a Lagrange point. What does a Lagrange point represent?
(A) The exact center of the Sun's core where nuclear fusion occurs.
(B) A point where gravitational pull equals the centripetal force.
(C) The atmospheric boundary where the Earth's gravity officially ends.
(D) A point on the Moon's surface that experiences zero gravity.
(E) Answer not known

130. Which of the following initiatives is most relevant for fostering a private space industry ecosystem in India?
(A) NGT (National Green Tribunal)
(B) FSSAI (Food Safety Authority of India)
(C) CPCB (Pollution Control Board)
(D) IN-SPACe (Indian Space Centre)
(E) Answer not known

131. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): Project Tiger, launched in 1973, led to a significant recovery in the tiger population in India.
Reason (R): It adopted an ecosystem approach by establishing Tiger Reserves with core inviolate areas and buffer zones.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

132. Match the Biosphere Reserves in List I with their respective States in List II.
List I: (Biosphere Reserves)
P. Agasthyamalai
Q. Pachmarhi
R. Nokrek
S. Similipal

Downloaded from www.pdf.tube

IV. Shared frequencies for private networks
(A) P-III, Q-I, R-II, S-IV
(B) P-I, Q-III, R-IV, S-II
(C) P-II, Q-I, R-IV, S-III
(D) P-III, Q-II, R-I, S-IV
(E) Answer not known

103. Identify the correctly matched pair regarding quantum computing concepts.
(A) Qubit - Can only represent a 0 or a 1 at any given moment in time.
(B) Superposition - The ability of a system to be in multiple states.
(C) Entanglement - Breaking a cryptographic code using traditional processors.
(D) Quantum Supremacy - The legal framework governing all quantum patents.
(E) Answer not known

104. Consider the following statements about India's National Quantum Mission:
I. It aims to seed, nurture, and scale up scientific and industrial R&D in quantum technology.
II. It targets developing intermediate-scale quantum computers with 50-1000 physical qubits.
III. It was launched under the Ministry of Environment, Forest and Climate Change.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II and III
(D) I only
(E) Answer not known

105. Consider the following applications of 5G technology:
I. Enhanced Mobile Broadband (eMBB)
II. Ultra-Reliable Low-Latency Communications (URLLC)
III. Massive Machine Type Communications (mMTC)
IV. Slower internet speeds for rural conservation
V. Seamless integration of Internet of Things (IoT) devices
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, III, IV and V
(D) I, II and IV
(E) Answer not known

106. Arrange the mobile telecommunication generations in correct order of their key defining feature development:
I. 4G (LTE)
II. 1G
III. 5G
IV. 2G
V. 3G
(A) II, IV, V, I, III
(B) II, V, IV, I, III
(C) IV, II, V, I, III
(D) II, IV, I, V, III
(E) Answer not known

107. The fundamental principle of quantum computing that allows particles to be inextricably linked, meaning the state of one instantly influences the state of another regardless of distance, is known as:
(A) Quantum Superposition
(B) Quantum Entanglement
(C) Quantum Interference
(D) Quantum Tunneling
(E) Answer not known

NODIA

108. In which year did the widespread commercial rollout of 5G services officially begin in India?
(A) 2018
(B) 2020
(C) 2022
(D) 2024
(E) Answer not known

109. Traditional computers process data in bits. What is the basic unit of information in quantum computing?
(A) Quantum Bit (Qubit)
(B) Byte
(C) Quantum Gate
(D) Nanobit
(E) Answer not known

110. Which of the following is a key usage scenario specifically defined by the ITU for 5G networks intended to support a very high density of connected devices per square kilometer?
(A) Enhanced Mobile Broadband (eMBB)
(B) Ultra-Reliable Low-Latency Communications (URLLC)

(A) Coromandel Coast
(B) Palk Bay
(C) Kanyakumari Coast
(D) Ennore Estuary
(E) Answer not known

141. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): A high Biological Oxygen Demand (BOD) in a water body indicates high levels of organic pollution.
Reason (R): Aerobic bacteria consume large amounts of dissolved oxygen to decompose the organic matter present in the water.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

142. Match the international environmental conventions in List I with their scope in List II.
List I: (International Conventions)
P. Basel Convention
Q. Rotterdam Convention
R. Stockholm Convention
S. Minamata Convention
List II: (Scope)
I. Persistent Organic Pollutants (POPs)
II. Transboundary movements of hazardous wastes
III. Prior Informed Consent for certain hazardous chemicals
IV. Mercury emission and releases
(A) P-II, Q-III, R-I, S-IV
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-I, R-IV, S-II
(D) P-II, Q-I, R-III, S-IV
(E) Answer not known

143. Identify the incorrectly matched pair regarding climate protocols and agreements.
(A) Kyoto Protocol - Binding emission reduction targets for developed nations
(B) Montreal Protocol - Phase-out of ozone-depleting substances
(C) Paris Agreement - Keep global temperature rise well below 2°C
(D) Cartagena Protocol - Global ban on all fossil fuel extraction
(E) Answer not known

144. Consider the following statements regarding the Pallikaranai marshland in Chennai:
I. It is a freshwater marsh and a major natural rainwater harvesting system for the city.
II. It has been designated as a Ramsar site of international importance.
III. It has significantly shrunk due to illegal dumping of solid waste and urban encroachment.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I, II and III
(E) Answer not known

145. Consider the following statements regarding the Intergovernmental Panel on Climate Change (IPCC):
I. It was established by UNEP and WMO.
II. It conducts its own original field research to measure greenhouse gases.
III. Its Assessment Reports provide scientific basis for climate policies.
IV. It won the Nobel Peace Prize in 2007.
V. It strongly advises shifting towards renewable energy to limit global warming.
Which of the above statement(s) is/are correct?
(A) I, III, IV and V
(B) II, III, IV and V
(C) I, II, III and V
(D) I, II and IV
(E) Answer not known

146. Arrange the fundamental processes of the Nitrogen cycle in their logical sequential order starting from atmospheric nitrogen:
I. Nitrogen Fixation
II. Denitrification
III. Assimilation
IV. Ammonification
V. Nitrification
(A) I, V, III, IV, II
(B) I, III, IV, V, II
(C) I, IV, V, III, II
(D) I, III, V, IV, II
(E) Answer not known

Click Here to Buy book on Amazon

Anemia.
(C) Creating resilient and pest-resistant agricultural crops.
(D) Developing specific and targeted cancer therapies.
(E) Answer not known

118. Which biological tool is most appropriate for combining genetic material from multiple sources to create sequences that would not otherwise be found in the genome?
(A) Polymerase Chain Reaction methods
(B) Gel Electrophoresis techniques
(C) Southern Blotting analysis
(D) Recombinant DNA technology
(E) Answer not known

119. A key objective of Precision Medicine is to:
(A) Apply a 'one-size-fits-all' approach to medical treatments.
(B) Tailor treatment to individual patient characteristics.
(C) Eliminate the total need for any further diagnostic testing.
(D) Use surgical methods for treating all genetic disorders.
(E) Answer not known

120. Microbes that are genetically engineered to consume and break down environmental pollutants like oil spills fall under the category of:
(A) Pathogenic bacterial strains
(B) Biofortified agricultural crops
(C) Bioremediation agents
(D) Environmental biosensors
(E) Answer not known

121. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): The Chandrayaan-3 mission successfully demonstrated safe and soft landing on the lunar surface.
Reason (R): This achievement made India the first country to land a spacecraft near the Moon's South Pole.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

122. Match the recent ISRO missions in List I with their primary objectives in List II.
List I: (ISRO Missions)
P. Aditya L1
Q. Gaganyaan
R. NISAR
S. XPoSat
List II: (Objectives)
I. Human spaceflight programme
II. Solar observatory to study the Sun's atmosphere
III. X-Ray polarization study of celestial sources
IV. Earth observation using dual-frequency radar
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-IV, R-I, S-II
(D) P-II, Q-I, R-III, S-IV
(E) Answer not known

123. Identify the incorrectly matched pair regarding recent scientific initiatives in India.
(A) IN-SPACe - Facilitating private sector participation in space activities
(B) Param Pravega - India's first fully reusable launch vehicle
(C) LIGO-India - Observing gravitational waves from the universe
(D) Deep Ocean Mission - Exploring deep-sea resources and biodiversity
(E) Answer not known

124. Consider the following statements about the Aditya L1 mission:
I. It is placed in a halo orbit around the Lagrange point 1 (L1) of the Sun-Earth system.
II. It allows continuous observation of the Sun without any eclipses.
III. It aims to study the solar corona and solar wind.
Which of the above statement(s) is/are correct?
(A) I and II
(B) I and III
(C) II and III
(D) I, II and III
(E) Answer not known

Downloaded from www.pdf.tube

in the world.
II. It capitalizes on the geographic wind funneling effect of the Western Ghats.
III. It relies primarily on solar panels to generate electricity.
IV. It significantly contributes to Tamil Nadu being a leader in wind energy capacity in India.

Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) II, III and IV
(D) I and II
(E) Answer not known

155. Select the correct transition sequence that aligns with India's climate commitments for energy transition.
(A) Renewable energy → Coal → Oil → Biomass burning
(B) Coal dominance → Expansion of Renewables → Green Hydrogen Integration → Net Zero Emissions
(C) Net Zero Emissions → Coal dominance → Expansion of Renewables → Green Hydrogen
(D) Expansion of Renewables → Coal dominance → Biomass burning → Green Hydrogen
(E) Answer not known

156. The total amount of greenhouse gases generated by our actions, typically expressed as carbon dioxide equivalent, is known as our:
(A) Carbon Footprint
(B) Ecological Niche
(C) Biomagnification level
(D) Ozone Depleting Potential
(E) Answer not known

157. Technologies such as Web3, Virtual Reality, and Augmented Reality, when combined to create an immersive, shared digital space, fall under the broad classification of:
(A) Metaverse
(B) Deep web
(C) Quantum networking
(D) Analog telecommunications
(E) Answer not known

158. When comparing Augmented Reality (AR) and Virtual Reality (VR), which statement is true?
(A) VR adds digital elements to a live view, whereas AR requires a headset.
(B) AR is used for video games, while VR is only used for medical surgeries.
(C) AR enhances the real world, while VR immerses the user in a simulation.
(D) Both AR and VR require quantum computers to function for basic tasks.
(E) Answer not known

NODIA

159. A key feature of the National Green Hydrogen Mission is to produce hydrogen using:
(A) Gasification of coal with high levels of carbon emissions.
(B) Splitting natural gas without any carbon capture systems.
(C) Heavy water reactors found in domestic nuclear plants.
(D) Electrolysis of water powered by renewable energy sources.
(E) Answer not known

160. The mandatory segregation of municipal solid waste at the source into biodegradable, non-biodegradable, and domestic hazardous waste is a key directive of which rules?
(A) Plastic Waste Management Rules
(B) E-Waste (Management) Rules
(C) Solid Waste Management Rules, 2016
(D) Hazardous Waste Management Rules
(E) Answer not known

List II: (States)
I. Madhya Pradesh
II. Tamil Nadu / Kerala
III. Odisha
IV. Meghalaya
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-III, Q-I, R-IV, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

133. Identify the correctly matched pair regarding endangered species conservation in Tamil Nadu.
(A) Project Nilgiri Tahr - Protecting the state animal in the Western Ghats.
(B) Slender Loris Sanctuary - Located within the mangroves of Pichavaram.
(C) Dugong Conservation Reserve - Established within the local Pulicat Lake.
(D) Olive Ridley Turtles - Breed primarily in the freshwaters of the Cauvery.
(E) Answer not known

134. Consider the following statements about the Gulf of Mannar Biosphere Reserve:
I. It is the first marine biosphere reserve in South and South East Asia.
II. It is known for its rich coral reefs and seagrass ecosystems.
III. It serves as a prime habitat for the endangered marine mammal, Dugong.
IV. It is completely closed to all forms of traditional fishing by local communities.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) I, II and III
(D) II, III and IV
(E) Answer not known

135. Select the correct order of energy flow and nutrient transfer in a Detritus Food Chain.
(A) Living Plant → Herbivore → Carnivore
(B) Dead Organic Matter → Detritivores → Predators
(C) Phytoplankton → Zooplankton → Small Fish
(D) Sun → Primary Producers → Apex Predators
(E) Answer not known

136. What is the most direct inference about the impact of linear infrastructure projects (like highways and railways) passing through dense forests?
(A) They drastically increase the genetic diversity of isolated animal populations.
(B) They eliminate the threat of invasive alien species.
(C) They cause habitat fragmentation, impeding the natural movement of wildlife.
(D) They encourage the growth of endemic plant species along the borders.
(E) Answer not known

137. A primary advantage of promoting regulated Ecotourism in wildlife sanctuaries in Tamil Nadu is:
(A) It provides uncontrolled access to sensitive core zones for mass tourism activities.
(B) It completely replaces the natural food sources for all local wild animal species.
(C) It encourages the clearing of forests for the building of large luxury hotels.
(D) It generates awareness and provides alternative livelihoods for locals.
(E) Answer not known

138. The transition zone between two distinct ecological communities, such as the area where a forest meets a grassland, is defined as:
(A) Ecotone
(B) Ecotype
(C) Ecosphere
(D) Ecological Niche
(E) Answer not known

139. Project Nilgiri Tahr, an initiative of the Tamil Nadu government, focuses on conserving the species which is natively found in:
(A) Coastal sandy beaches and estuarine dunes.
(B) Montane grasslands and rocky terrains of the Western Ghats.
(C) Dry deciduous forests within the Eastern Ghats.
(D) Mangrove wetlands found on the Coromandel coast.
(E) Answer not known

140. India's first Dugong Conservation Reserve has been established in the coastal waters of which region in Tamil Nadu?

Click Here to Buy book on Amazon

(C) Massive Machine Type Communications (mMTC)
(D) Asymmetric Digital Subscriber Line (ADSL)
(E) Answer not known

111. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): CRISPR-Cas9 is a revolutionary technology that allows scientists to edit genomes with high precision.
Reason (R): It utilizes an enzyme called Cas9 acting as 'molecular scissors' guided by a piece of RNA to cut DNA at a specific location.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

112. Match the Biotechnology terms in List I with their functions in List II.
List I: (Biotechnology Terms)
P. mRNA
Q. Recombinant DNA
R. Monoclonal Antibodies
S. Stem Cells
List II: (Functions)
I. Undifferentiated cells that can develop into specialized types
II. Carries genetic instructions for protein synthesis
III. DNA formed by combining sequences from different sources
IV. Laboratory-made molecules engineered to serve as substitute antibodies
(A) P-II, Q-III, R-IV, S-I
(B) P-III, Q-II, R-I, S-IV
(C) P-I, Q-IV, R-III, S-II
(D) P-II, Q-I, R-IV, S-III
(E) Answer not known

113. Identify the correctly matched pair regarding precision medicine.
(A) Pharmacogenomics - Prescribing identical drug doses to all patients globally.
(B) Targeted Therapy - Treating cancer by attacking specific genes or proteins.
(C) Gene Therapy - Using traditional herbal medicines for the cure of genetic diseases.
(D) Biomarkers - Mechanical devices implanted to measure various blood pressure levels.
(E) Answer not known

114. Consider the following statements about mRNA vaccines:
I. They teach human cells how to make a protein that triggers an immune response.
II. They alter the recipient's DNA permanently.
III. They do not contain a live virus.
IV. The technology was crucial in developing rapid vaccines against COVID-19.
Which of the above statement(s) is/are correct?
(A) I, III and IV
(B) I, II and III
(C) II, III and IV
(D) I and IV
(E) Answer not known

NODIA

115. Select the correct general sequence for the CRISPR-Cas9 gene-editing process in a laboratory.
(A) Cell division → Guide RNA design → DNA cleavage → Cas9 injection
(B) Guide RNA design → Complex formation with Cas9 → Target DNA identification → DNA cleavage → DNA repair/editing
(C) DNA repair → Guide RNA design → DNA cleavage → Target DNA identification
(D) Target DNA identification → Cell division → DNA repair → Guide RNA design
(E) Answer not known

116. Identify the incorrect statement regarding the mechanism of mRNA vaccines.
(A) mRNA instructs cells to create a spike protein found on the virus surface.
(B) The immune system recognizes the protein as foreign and builds antibodies.
(C) The mRNA strand integrates directly into the recipient's human genome.
(D) After the protein is made, the cell breaks down the mRNA instructions.
(E) Answer not known

117. Which of the following is NOT a current or highly researched application of CRISPR technology?
(A) Reversing the gravitational pull in biological organisms.
(B) Curing genetic disorders such as Sickle Cell

147. Which of the following correctly describes the main components that form Photochemical Smog?
(A) Nitrogen oxides (NOx), Volatile Organic Compounds (VOCs), and sunlight.
(B) Sulfur dioxide, smoke, and fog within a cool and damp winter climate.
(C) Carbon dioxide, water vapor, and ultraviolet radiation in the air.
(D) Chlorofluorocarbons, methane, and ozone found in the stratosphere.
(E) Answer not known

148. Identify the incorrect statement regarding bioplastics.
(A) Bioplastics are manufactured from biological resources like corn starch or sugarcane.
(B) Some bioplastics are physically identical to petroleum-based plastics and cannot be composted easily.
(C) All bioplastics are guaranteed to completely biodegrade in natural environments within weeks.
(D) They offer a potential reduction in carbon footprint compared to conventional plastics.
(E) Answer not known

149. Which of the following is considered a non-point source of water pollution?
(A) Agricultural runoff carrying fertilizers and pesticides into a river.
(B) Discharge pipe coming from a specific industrial chemical plant.
(C) Effluent outlet of a managed municipal sewage treatment plant.
(D) A leaking underground oil storage tank in a remote location.
(E) Answer not known

150. Which process is most appropriate for describing the long-term capture and storage of atmospheric carbon dioxide to mitigate global warming?
(A) Carbon offset programs
(B) Carbon dating methods
(C) Biomagnification levels
(D) Carbon sequestration
(E) Answer not known

151. The following question consists of an Assertion (A) and a Reason (R).

Assertion (A): Hydrogen fuel cells are considered a clean energy alternative for vehicles.
Reason (R): The only by-product emitted by a hydrogen fuel cell during electricity generation is water vapor.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

152. Match the emerging technologies in List I with their general concepts in List II.
List I: (Emerging Technologies)
P. Augmented Reality (AR)
Q. Virtual Reality (VR)
R. 3D Printing
S. Nanotechnology
List II: (Concepts)
I. Complete immersion in a simulated environment
II. Overlays digital information onto the real world
III. Manipulation of matter on an atomic or molecular scale
IV. Additive manufacturing of objects layer by layer
(A) P-II, Q-I, R-IV, S-III
(B) P-I, Q-II, R-III, S-IV
(C) P-IV, Q-III, R-I, S-II
(D) P-II, Q-IV, R-I, S-III
(E) Answer not known

153. Identify the correctly matched pair regarding offshore wind energy potential in Tamil Nadu.
(A) Nilgiri Hills - Ideal location for massive offshore turbines.
(B) Chennai IT Corridor - Designated solely for offshore wind.
(C) Palani Hills - Strong offshore wind currents from the Bay.
(D) Gulf of Mannar region - High potential for wind installations.
(E) Answer not known

154. Consider the following statements about the Muppandal Wind Farm in Tamil Nadu:
I. It is one of the largest onshore wind farms

Downloaded from www.pdf.tube

(E) Answer not known

95. Select the correct general sequence of data flow in an Internet of Things (IoT) system.
(A) Cloud Processing → Sensors → User Interface → Actuators
(B) Sensors → Connectivity → Data Processing/ Cloud → User Interface
(C) User Interface → Cloud Processing → Sensors → Actuators
(D) Connectivity → Actuators → Cloud Processing → Sensors
(E) Answer not known

96. Which of the following is a primary feature of implementing IoT in 'Smart Agriculture'?
(A) Complete elimination of natural sunlight using powerful artificial lamps.
(B) Replacing all biological seeds with synthetic micro-chips for tracking.
(C) Real-time monitoring of soil moisture to optimize local irrigation.
(D) Manual tilling of farm land using traditional hand-held farming tools.
(E) Answer not known

97. Which of the following is an example of an IoT sensor application in a Smart City?
(A) A standard physical lock and key used for a municipal office door.
(B) A smart bin that alerts waste management when it is full.
(C) A printed map showing all local city bus routes and schedules.
(D) A standard concrete pavement used for urban pedestrian walkways.
(E) Answer not known

98. Which of the following is considered the least likely vulnerability in a fully decentralized public blockchain network?
(A) 51% Attack involving a majority of network nodes.
(B) Smart contract bugs within the decentralized code.
(C) Phishing attacks targeting individual user wallets.
(D) Single point of failure such as a server crash.
(E) Answer not known

NODIA

99. What can be inferred about the impact of Blockchain technology on land registry systems?
(A) It will enhance transparency and drastically reduce property fraud.
(B) It will increase the reliance on middle-men and brokers.
(C) It will allow property records to be easily altered by unauthorized parties.
(D) It will make land registration completely undocumented.
(E) Answer not known

100. A major disadvantage of large-scale IoT implementation in Smart Cities is:
(A) Significantly decreased efficiency in local traffic management systems.
(B) Slower response times during critical municipal emergency situations.
(C) High risk of cybersecurity threats and data privacy breaches.
(D) A major reduction in the total volume of digital data generated daily.
(E) Answer not known

101. The following question consists of an Assertion (A) and a Reason (R).
Assertion (A): 5G technology provides significantly lower latency compared to 4G technology.
Reason (R): Low latency is crucial for real-time applications like remote robotic surgery and autonomous driving.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
(E) Answer not known

102. Match the 5G frequency bands in List I with their characteristic features in List II.
List I: (5G Frequency Bands)
P. Low-band 5G
Q. Mid-band 5G
R. High-band (mmWave) 5G
S. Unlicensed spectrum
List II: (Characteristic Features)
I. Balances speed and coverage area
II. Ultra-high speeds but very limited range
III. Wide coverage area but speeds similar to 4G

ANSWERS

1. (A) Both A and R are true and R is the correct explanation of A.
The Nilgiri Biosphere Reserve stands as a pivotal ecological hotspot in the Western Ghats region, hosting numerous species found nowhere else. This high level of endemism is primarily driven by its diverse landscape. The area encompasses varied climatic zones and vegetation types, specifically spanning from tropical evergreen forests to unique montane sholas and dry deciduous forests throughout the reserve.

2. (A) P-III, Q-I, R-IV, S-II
Biogeochemical cycles circulate essential elements through biotic and abiotic components. The carbon cycle represents a global gaseous process, while phosphorus follows a sedimentary path through rocks. The water cycle is synonymous with the hydrological movement of moisture. Nitrogen cycling uniquely relies on bacterial driven gaseous transformations to make atmospheric nitrogen usable for plants and other organisms in the biosphere.

3. (A) Mudumalai - Theni
Tamil Nadu hosts several critical tiger reserves to protect its apex predator populations. Mudumalai Tiger Reserve is actually located in the Nilgiris district, sharing borders with Kerala and Karnataka. Theni district is associated with the Srivilliputhur Megamalai Tiger Reserve. Other reserves like Kalakkad Mundanthurai, Sathyamangalam, and Anamalai are correctly placed in Tirunelveli, Erode, and Coimbatore regions respectively within the state.

4. (B) I and III
Ecosystems consist of interacting abiotic and biotic components. Non-living factors like sunlight, temperature, and soil pH provide the physical framework for life. While primary producers are vital biotic elements, they do not represent the entire biological community. Decomposers play a critical role by breaking down organic matter, thereby recycling essential nutrients back into the abiotic environment for reuse by plants.

5. (C) I, III and IV
Food webs illustrate the complex, interconnected nature of multiple food chains within an ecosystem. Raymond Lindeman proposed the ten percent law, stating that only a fraction of energy passes between trophic levels. Autotrophs always form the foundational base of ecological pyramids. Conversely, energy flow is strictly unidirectional, and saprotrophs function as decomposers rather than the primary producers at the first level.

6. (A) III, I, V, IV, II
Ecological levels represent the hierarchy of biological organization in nature. The sequence begins with the individual organism as the basic unit. Multiple individuals of one species form a population, while interacting populations create a community. Integrating these communities with their physical environment results in an ecosystem, finally culminating in the global biosphere where all life and ecosystems across Earth exist.

7. (B) The study of interactions between organisms and their environment.
Ecology is a scientific branch that investigates the complex relationships between living organisms and their physical surroundings. It examines how biotic factors interact with abiotic components like water, soil, and climate to sustain life. This field focuses on understanding the distribution and abundance of species and the vital energy flow through various organizational levels in nature across different habitats and ecosystems.

8. (C) It is utilized for life processes and lost as heat.
The ten percent law dictates that only a small portion of energy is transferred between successive trophic levels. The remaining ninety percent is primarily utilized by the organism for metabolic processes, growth, and reproduction. Additionally, a significant amount of this energy is lost to the surroundings as heat, preventing its transfer to the next consumer level in the food chain.

Click Here to Buy book on Amazon

26. (A) V, II, IV, I, III
The Air Quality Index categorizes air quality based on the concentration of pollutants and their associated health risks. The scale begins with the "Good" category, followed by "Satisfactory" and "Moderate" as pollution levels rise. Further degradation leads to the "Poor" and "Very Poor" classifications. The most hazardous level is "Severe," which indicates extreme pollution that can affect even healthy individuals.

27. (B) COD measures both biodegradable and non-biodegradable organic matter in the water.
Biological Oxygen Demand and Chemical Oxygen Demand are standard parameters for assessing water quality. COD is a broader measurement because it accounts for both biodegradable and non-biodegradable organic matter through chemical oxidation. Consequently, COD values are typically higher than BOD values. While BOD requires several days for microbial incubation, COD is a much faster test, providing results within a few hours.

28. (B) It is formed by sunlight reacting with nitrogen oxides and volatile organic compounds.
Photochemical smog is a modern environmental issue common in sunny, urban environments with high vehicle traffic. It forms when sunlight triggers chemical reactions between nitrogen oxides and volatile organic compounds. This process generates ground-level ozone and other secondary pollutants. Unlike traditional industrial smog caused by coal smoke in cold climates, photochemical smog requires intense solar radiation to drive these complex reactions.

29. (A) Peroxyacetyl nitrate (PAN)
Air pollutants are classified into primary and secondary categories based on their origin. Primary pollutants, such as sulfur dioxide, carbon monoxide, and lead, are emitted directly from sources like factories and vehicles. Secondary pollutants, like peroxyacetyl nitrate, are not emitted directly. Instead, they form in the atmosphere through complex chemical reactions between primary pollutants and other atmospheric components in the presence of sunlight.

30. (C) Water Vapour
The natural greenhouse effect is essential for maintaining Earth's temperature at a level capable of supporting life. While carbon dioxide and methane are frequently discussed in the context of climate change, water vapor is actually the most significant natural greenhouse gas. It accounts for the largest portion of the atmosphere's heat-trapping ability, followed by carbon dioxide, methane, and various other trace gases.

31. (A) Both A and R are true and R is the correct explanation of A.
Persistent exposure to high-intensity sound is a major cause of environmental health issues. Noise levels exceeding 85 decibels are considered hazardous and can lead to permanent hearing impairment. This occurs because intense sound vibrations physically damage the delicate hair cells located within the cochlea of the inner ear. Once these cells are destroyed, they cannot regenerate, resulting in irreversible noise-induced hearing loss.

32. (A) P-II, Q-III, R-IV, S-I
Soil remediation techniques utilize various physical, chemical, and biological mechanisms to remove contaminants. Phytoremediation employs plants to absorb or neutralize pollutants. Bioventing involves injecting air into the soil to stimulate the activity of indigenous microorganisms. Soil washing uses water or solvents to scrub away hazardous substances. Finally, thermal desorption applies heat to vaporize and separate volatile contaminants from the soil matrix efficiently.

33. (B) Uranium-235 - Ozone layer depletion catalyst.
Radioactive isotopes pose significant health risks when released into the environment. Iodine-131 is specifically linked to thyroid cancer, while Strontium-90 can accumulate in bones, causing cancer. Cesium-137 is known to cause severe internal tissue damage. However, Uranium-235 is primarily used as nuclear fuel and is not a catalyst for ozone layer depletion, which is caused by chemicals like chlorofluorocarbons.

34. (B) II and III
Managing radioactive materials is a critical safety concern for nuclear energy production. High-

NODIA

community-protected forest patches where species are conserved within their original environment. This makes them a form of in-situ conservation, contrasting with the artificial environments utilized in other ex-situ conservation methods for endangered species.

18. (D) Keystone species
Keystone species play a disproportionately large role in maintaining the structure and integrity of an ecological community. Their presence or absence significantly influences the survival and abundance of many other species within the same environment. Unlike flagship species used for conservation branding, keystone species are defined by their functional importance and the cascading effects their loss would have on their specific ecosystems.

19. (A) Fish-eating birds
Biomagnification refers to the increasing concentration of persistent, toxic substances as they move up the food chain. In aquatic environments, chemicals like pesticides accumulate in small amounts in phytoplankton. These levels increase in zooplankton and fish. Ultimately, top-level predators, such as fish-eating birds, exhibit the highest concentrations because they consume numerous contaminated organisms from the lower trophic levels in water.

20. (C) Endemic species
Endemic species are organisms naturally restricted to a specific, well-defined geographical region, such as an island or a particular mountain range. They are not found naturally anywhere else on Earth, making them highly vulnerable to local environmental changes and extinction. This is distinct from cosmopolitan species, which have a broad global distribution and can thrive in various habitats worldwide regardless of location.

21. (A) Both A and R are true and R is the correct explanation of A.
The Air Quality Index serves as a vital communication tool for public health and environmental awareness. It converts technical concentrations of various pollutants into a single understandable number associated with specific colors and risk categories. This simplification allows the general public to quickly gauge the safety of their local air and understand the potential respiratory impacts of current pollution levels in cities.

22. (A) P-II, Q-I, R-IV, S-III
Various air pollutants exert distinct pressures on human health and the environment. Carbon monoxide is dangerous because it binds to hemoglobin, reducing the blood's oxygen-carrying capacity. Sulfur dioxide is a primary precursor for acid rain formation. Chlorofluorocarbons are responsible for degrading the stratospheric ozone layer, while fine particulate matter like PM 2.5 can penetrate deeply into the human respiratory system causing damage.

23. (B) Eutrophication - The enrichment of a water body with excess biological nutrients.
Water pollution leads to diverse ecological and health complications. Eutrophication involves the excessive enrichment of water bodies with nutrients like nitrates and phosphates, causing harmful algal blooms. Conversely, Minamata disease is caused by mercury poisoning, while Itai-Itai results from cadmium exposure. Blue baby syndrome is associated with high nitrate levels in drinking water rather than fluoride levels found in groundwater.

24. (B) I and II
The Water Prevention and Control of Pollution Act was enacted in 1974 to safeguard aquatic resources. This legislation was instrumental in establishing the Central Pollution Control Board to monitor and regulate water quality standards across the country. While it focuses on managing industrial and domestic effluents, it does not regulate urban noise pollution, which is handled under different environmental legislative frameworks.

25. (B) III and V
Eutrophication is a process where nutrient runoff from agricultural fertilizers leads to excessive algal growth in lakes and ponds. This phenomenon results in oxygen depletion, which severely threatens the survival of fish and other aquatic life. While it can occur naturally over very long periods, human activities significantly accelerate the process. Therefore, it is incorrect to view it as an exclusively natural process.

NODIA

serves as a universal call to action, encouraging governments to integrate environmental sustainability into their long-term development strategies.

78. (C) It promotes a decentralized, inclusive, and bottom-up approach to Indian open science.
The Science, Technology, and Innovation Policy 2020 represents a major shift toward a more decentralized and inclusive research environment in India. It promotes a bottom-up approach that encourages participation from various stakeholders, including the private sector. By fostering an open science framework, the policy aims to make scientific knowledge more accessible and drive national progress through collaborative research efforts.

79. (D) The index is compiled strictly by the World Bank without domestic data.
The SDG India Index is a comprehensive monitoring tool developed by NITI Aayog to track the performance of states and union territories. It uses a scoring system to categorize regions into groups like "Aspirant," "Performer," and "Front Runner." Importantly, the index is based on domestic data collected through national systems, rather than being compiled by international organizations like the World Bank.

80. (C) Promotion of Space Tourism
The seventeen Sustainable Development Goals cover a wide range of global challenges, from environmental protection to social justice. Key goals include reducing inequalities, promoting decent work, and building strong institutions for peace. While space exploration is a significant scientific endeavor, the promotion of space tourism is not an official objective of the 2030 Agenda. Instead, the goals focus on sustainability.

81. (A) Both A and R are true and R is the correct explanation of A.
Deep learning is a specialized branch of machine learning that utilizes complex artificial neural networks with multiple layers to process information. These sophisticated architectures are inspired by the human brain and are particularly effective at analyzing large volumes of unstructured data. By automatically identifying intricate patterns without human intervention, deep learning enables advanced applications in fields like speech and image recognition.

82. (A) P-II, Q-IV, R-I, S-III
Artificial intelligence encompasses several distinct fields and levels of capability. Artificial Narrow Intelligence is designed to perform specific tasks, whereas Artificial General Intelligence aims for human-level cognitive flexibility. Machine learning involves algorithms that improve by analyzing data to make accurate predictions. Natural Language Processing focuses on the interaction between computers and human language, allowing machines to understand, interpret, and generate text.

83. (A) Deepfakes - Enhancing data privacy and cybersecurity
Artificial intelligence has numerous beneficial applications across various sectors, including healthcare for disease detection and finance for fraud prevention. In agriculture, it enables precision farming techniques to improve crop yields. However, the use of deepfakes is primarily associated with significant ethical and security risks, such as misinformation. Therefore, deepfakes are viewed as a challenge to data privacy and cybersecurity in modern digital systems.

84. (B) I and II
The rapid development of artificial intelligence has raised several critical ethical concerns. Algorithmic bias can occur if the training data contains historical prejudices, leading to discriminatory outcomes in areas like hiring. Additionally, the "black box" problem refers to the lack of transparency in how complex models reach decisions. While environmental sustainability is important, the primary ethical focus remains on ensuring fairness.

85. (A) I, II, III and V
Deep learning represents a significant advancement in computer science, modeled after the structure of the human brain. It relies on multi-layered neural networks to process information and requires vast amounts of data to achieve high accuracy. These models excel at interpreting unstructured data like audio and images, with Convolutional Neural Networks

Downloaded from www.pdf.tube

level waste remains hazardous for thousands of years, requiring secure disposal in deep geological repositories. This radiation can induce genetic mutations that persist across generations. While the Kudankulam plant in Tamil Nadu uses specialized pressurized water reactors, it is important to note that natural background radiation is present everywhere.

35. (A) Water → Zooplankton → Small Fish → Large Fish → Fish-eating birds
Biomagnification describes the process through which the concentration of certain chemicals increases at higher levels of a food chain. In an aquatic system, these substances move from the water into tiny zooplankton. Small fish consume the zooplankton, followed by larger predatory fish. The sequence culminates in top predators, such as fish-eating birds, which accumulate the highest and most toxic concentrations.

36. (C) Siltation of reservoirs and reduction in hydroelectric power capacity.
In hilly regions like the Nilgiris, heavy rainfall and deforestation often trigger significant soil erosion. This loose sediment is carried downstream by rivers and eventually settles in water reservoirs. This siltation process reduces the total water storage capacity of dams. Consequently, it directly impairs the efficiency of hydroelectric power generation and increases the risk of flash flooding during periods of heavy rain.

37. (A) It is generally more cost-effective and environmentally friendly.
Bioremediation offers a sustainable alternative to traditional chemical and physical methods for cleaning up contaminated soil and water. By utilizing naturally occurring microorganisms or plants to break down pollutants, it minimizes the need for energy-intensive excavation and transport. This biological approach is generally more cost-effective and environmentally friendly, as it avoids the introduction of harsh synthetic chemicals into the environment.

38. (D) Discarded electrical equipment including all of its components and spare parts.
Electronic waste, or e-waste, encompasses a broad range of discarded electrical and electronic devices. This includes entire units like computers and mobile phones, as well as their individual components and spare parts. Improper disposal of these items can release hazardous substances like lead and mercury into the environment. Effective management rules are necessary to ensure the safe recycling and recovery.

39. (C) 55 dB(A)
The Central Pollution Control Board has established specific noise level standards to protect public health in different urban zones. For residential areas, the permissible limit is strictly set at 55 decibels during the daytime, which spans from six in the morning to ten at night. These regulations aim to minimize the physiological and psychological stresses associated with excessive noise in living environments.

40. (C) Chernobyl
The 1986 disaster at the Chernobyl nuclear power plant remains one of the most significant industrial accidents in history. It released massive quantities of radioactive particles into the atmosphere, affecting large parts of Europe. This catastrophe led to a fundamental reassessment of nuclear safety protocols and global norms for the management and disposal of radioactive waste to prevent such events in the future.

41. (A) Both A and R are true and R is the correct explanation of A.
The Montreal Protocol is widely celebrated as a landmark achievement in international environmental diplomacy. By establishing a clear, time-bound framework for phasing out ozone-depleting substances like chlorofluorocarbons, it gained universal ratification. The collective global action initiated by this treaty has directly led to the gradual recovery of the stratospheric ozone layer, protecting the planet from harmful ultraviolet radiation.

42. (A) P-II, Q-I, R-IV, S-III
Greenhouse gases originate from diverse human activities, contributing significantly to global warming. Carbon dioxide is primarily released through the combustion of fossil fuels for energy and transport. Methane is a major byproduct of livestock farming and paddy cultivation. Nitrous oxide emissions are largely linked to agricultural fertilizers, while hydrofluorocarbons are synthetic gases commonly used in refrigeration and air conditioning.

NODIA

43. (B) Primary microplastics - Intentionally manufactured tiny plastic particles.
Plastic pollution is categorized by the size and origin of the particles. Primary microplastics are intentionally manufactured to be extremely small, such as the microbeads found in certain personal care products. In contrast, secondary microplastics result from the fragmentation of larger items like bottles or bags. Understanding these distinctions is crucial for developing effective policies to mitigate the environmental impact of plastic waste.

44. (A) I and II
The 'Meendum Manjappai' campaign is a major environmental initiative launched by the Tamil Nadu government to combat plastic pollution. It focuses on eliminating the widespread use of single-use plastic bags, which are a major source of litter. By promoting the revival of traditional yellow cloth bags, the campaign encourages sustainable consumer habits and highlights the importance of using eco-friendly alternatives.

45. (B) II, III, IV and V
Stratospheric ozone serves as a crucial shield against harmful solar radiation. Scientists measure its thickness using Dobson Units. The depletion of this layer, particularly prominent over Antarctica during the spring, allows more ultraviolet-B radiation to reach the Earth's surface. This process is driven by chlorofluorocarbons, which release active chlorine atoms that catalyze the destruction of ozone molecules when exposed to sunlight.

46. (A) IV, III, II, I
Global Warming Potential measures the heat-trapping ability of different gases relative to carbon dioxide over a specific period. Sulfur hexafluoride has an extremely high GWP, followed by nitrous oxide and methane. Although carbon dioxide has the lowest GWP among these gases, it remains the primary driver of climate change due to the sheer volume and persistence of its emissions.

47. (D) It prohibited the manufacturing, sale, and distribution of specified SUP items.
In July 2022, India implemented a nationwide ban on specific single-use plastic items characterized by high potential for littering and low utility. This regulation prohibits the manufacturing, sale, and distribution of items such as plastic sticks for balloons, earbuds, and cutlery. The mandate aims to reduce the environmental burden of plastic waste, particularly the non-biodegradable materials that clog drainage systems.

48. (C) It mandates that all developed nations completely halt industrial activities by 2030.
The Paris Agreement is a legally binding international treaty aimed at limiting global temperature increases to well below 2 degrees Celsius. It provides a framework for countries to submit increasingly ambitious climate actions every five years. While it emphasizes rapid decarbonization, it does not mandate the complete cessation of all industrial activities. Instead, it encourages a transition toward sustainable practices.

49. (B) Nitrogen (N2)
Greenhouse gases are characterized by their ability to absorb and emit infrared radiation, thereby trapping heat in the atmosphere. Major examples include methane, carbon dioxide, and water vapor. However, nitrogen, which makes up about 78 percent of the atmosphere, does not act as a greenhouse gas. Its molecular structure prevents it from effectively absorbing thermal radiation, allowing heat to escape.

50. (D) IPCC Assessment Reports
The Intergovernmental Panel on Climate Change provides the most comprehensive and authoritative scientific assessments on global warming. Its periodic Assessment Reports synthesize the latest research regarding climate trends, impacts, and future risks. These documents serve as a critical foundation for international negotiations and the development of national climate policies. They are distinct from the IUCN Red List, which focuses on species.

51. (A) Both A and R are true and R is the correct explanation of A.
Tamil Nadu has taken a pioneering role in climate governance by becoming the first Indian state to launch its own dedicated Climate Change Mission. This strategic move addresses the state's significant vulnerability to environmental shifts, including rising sea levels along its extensive

Click Here to Buy book on Amazon

coastline and increasingly erratic monsoon patterns. The mission aims to enhance resilience and implement mitigation strategies tailored to regional needs.

52. (A) P-I, Q-II, R-III, S-IV
India possesses diverse renewable energy resources distributed across various geographic locations. Kamuthi in Tamil Nadu hosts a massive solar power facility, while Muppandal is famous for its extensive wind farm. Puga Valley in Ladakh is a key site for exploring geothermal energy due to its unique geological features. The Gulf of Kutch in Gujarat is recognized for tidal energy potential.

53. (A) Rooftop Solar Scheme - Installing wind turbines on residential roofs
The Indian government has launched several schemes to promote the adoption of clean energy across different sectors. The PM-KUSUM scheme specifically supports the installation of solar-powered agricultural pumps. The National Hydrogen Mission focuses on producing green hydrogen using renewable electricity. However, the Rooftop Solar Scheme is designed for installing solar photovoltaic panels on buildings, rather than wind turbines as suggested.

54. (B) I, II and III
India's Nationally Determined Contributions outline its commitments to the global effort against climate change. Key targets include reducing the emissions intensity of its GDP and ensuring that half of its installed electric power capacity comes from non-fossil sources by 2030. Additionally, India aims to create a carbon sink through forest cover. The official target for achieving net-zero emissions is 2070.

55. (B) Tamil Nadu, Gujarat, Maharashtra
Wind energy potential in India is highly concentrated in states with favorable geographic and climatic conditions. Tamil Nadu, Gujarat, and Maharashtra lead the nation in installed wind capacity due to their extensive coastlines and consistent wind patterns. These states utilize both onshore and offshore wind resources to meet their growing energy demands. This contrasts with inland northern states with lower potential.

56. (C) Heat derived from the Earth's internal geological processes
Geothermal energy is a sustainable power source derived from the heat stored within the Earth's interior. This heat originates from the original formation of the planet and the ongoing radioactive decay of minerals in the crust. By tapping into hot water or steam found in underground reservoirs, power plants can generate electricity with minimal emissions. This process is independent of solar radiation.

57. (D) Natural Gas
Energy sources are classified as renewable or non-renewable based on their replenishment rate. Sources like wind, biomass, and hydropower are considered renewable because they are naturally replenished on a human timescale. In contrast, natural gas is a fossil fuel formed over millions of years from organic remains. Because it exists in finite quantities and cannot be replaced quickly, it is non-renewable.

58. (A) Wind energy is the largest part of Tamil Nadu's installed renewable capacity.
Tamil Nadu is a leader in India's renewable energy sector, with a diverse mix of wind and solar power. Currently, wind energy accounts for the largest portion of the state's total installed renewable capacity. While solar power is growing rapidly, it is limited by daylight hours. Wind energy often provides a more significant contribution to the state's power grid.

59. (B) It aims to make India a global leader in solar energy through policy diffusion.
The National Solar Mission is a cornerstone of India's energy policy, aimed at establishing the country as a global leader in solar power. It promotes the rapid scaling of solar technology through various incentives, research initiatives, and policy frameworks. By encouraging both large-scale utility projects and off-grid applications, the mission fosters domestic manufacturing and aims to reduce fossil fuel reliance.

NODIA

60. (B) Tidal Energy
Tidal energy is a predictable form of renewable power generated by the movement of tides in coastal areas. It harnesses the kinetic energy from the rising and falling of sea levels, which are

primarily caused by the gravitational interactions between the Earth, Moon, and Sun. This makes it more reliable than solar or wind power, as tidal patterns are calculated easily.

61. (A) Both A and R are true and R is the correct explanation of A.
The National Green Tribunal was established in 2010 as a specialized judicial body to handle complex environmental disputes efficiently. It aims to provide speedy justice and reduce the burden on higher courts regarding ecological protection cases. To maintain flexibility, the tribunal is not strictly bound by the Code of Civil Procedure. Instead, it operates based on principles of natural justice.

62. (A) P-II, Q-I, R-IV, S-III
India has enacted several key laws to manage its natural resources and protect the environment. The Wildlife Protection Act of 1972 focuses on safeguarding animal species. The Forest Conservation Act was introduced in 1980 to check deforestation. Following the Bhopal gas tragedy, the Environment Protection Act was passed in 1986. Finally, the Biological Diversity Act of 2002 ensures sustainable resource use.

63. (D) Public Hearing - Seeking clearance from international environmental agencies
The Environmental Impact Assessment process involves several structured steps to evaluate potential ecological consequences. Screening determines if a study is necessary, while scoping defines specific issues to be investigated. Appraisal involves a technical review by an expert committee. However, public hearing is a mandatory step for gathering input from local communities, rather than seeking clearance from international environmental agencies as suggested.

64. (B) I and III
The Forest Conservation Act of 1980 was enacted to address the rapid rate of deforestation in India. It mandates that state governments obtain prior approval from the central government before de-reserving forests or diverting forest land for non-forest purposes like mining. By regulating these activities, the act aims to maintain the ecological balance and ensure that industrial development is not destructive.

65. (A) I, II, III and V
The Environment Protection Act of 1986 serves as an umbrella legislation that provides a comprehensive framework for environmental management in India. It was enacted shortly after the Bhopal Gas Tragedy to empower the central government to coordinate pollution control activities. This act allows for the declaration of Eco-Sensitive Zones and encourages public participation in various conservation and management efforts.

66. (A) III, II, I, V, IV
The Environmental Impact Assessment process follows a specific chronological sequence to ensure thorough evaluation. It begins with screening to decide if a project requires an assessment, followed by scoping to identify key environmental issues. A draft report is then prepared and presented for public consultation to gather community feedback. Finally, an expert committee performs a detailed appraisal of the final report.

67. (A) 30 days from the date of the order
The National Green Tribunal provides an accessible forum for appealing environmental decisions made by government authorities. Under the National Green Tribunal Act, an aggrieved party generally has a time limit of thirty days from the date of the order to file an appeal. This relatively short window ensures that environmental disputes are addressed promptly, although the tribunal has some limited discretion.

68. (C) It ensures that the proponent complies with the stipulated mitigation measures.
Post-environmental clearance monitoring is a mandatory requirement designed to ensure that project proponents adhere to the conditions specified during the approval process. This phase involves regular reporting and inspections to verify that the implemented mitigation measures are effective in reducing environmental harm. By requiring ongoing compliance, the system aims to bridge the gap between theoretical assessments and actual ecological performance.

69. (A) It allows local communities to express concerns regarding specific project impacts.
Public consultation is a vital component of the Environmental Impact Assessment process,

Downloaded from www.pdf.tube

emphasizing transparency and democratic participation. It provides a formal platform for local communities and stakeholders to voice their concerns regarding the potential impacts of a proposed project on their livelihoods and health. This feedback ensures that local knowledge is considered and that mitigation plans address the specific community needs.

70. (D) Development that meets current needs without compromising future generations' needs.
Sustainable development is a holistic approach that seeks to balance economic growth with environmental protection and social equity. It is fundamentally defined as development that fulfills the needs of the present generation without compromising the ability of future generations to meet their own requirements. This concept emphasizes the responsible management of natural resources to ensure long-term ecological stability and continued well-being.

71. (B) Both A and R are true but R is not the correct explanation of A.
India has adopted a localized strategy to implement the Sustainable Development Goals, allowing for more targeted actions at the regional level. NITI Aayog plays a crucial role in this process by monitoring the progress of states through the SDG India Index. While this index provides a competitive framework for measuring achievements, the success of grassroots implementation depends on state-specific policies.

72. (A) P-III, Q-IV, R-I, S-II
The Sustainable Development Goals provide a comprehensive global framework for addressing various environmental and social challenges. Goal 6 focuses on ensuring clean water and sanitation for all, while Goal 7 aims for affordable and clean energy. Climate action is the primary focus of Goal 13, and Goal 15 is dedicated to protecting and restoring life on land, including forests.

73. (D) Technology Policy Statement 1983 - Emphasized self-reliance and indigenous technology.
India's Science, Technology, and Innovation policies have evolved significantly since independence to meet changing national needs. The Technology Policy Statement of 1983 was a landmark document that emphasized achieving technological self-reliance and promoting indigenous innovations. This focus helped build a strong foundation for domestic research and development, reducing the country's dependence on foreign technologies and fostering an environment for advancement.

NODIA

74. (A) I, II and IV
Tamil Nadu consistently emerges as a top-performing state in the SDG India Index, reflecting its robust social and economic policies. The state shows exceptional progress in areas like poverty reduction and healthcare, which significantly boosts its overall ranking. Furthermore, Tamil Nadu has integrated these sustainable targets into its annual budgetary processes. The state is officially categorized as a "front runner."

75. (B) No Poverty, Zero Hunger, Good Health and Well-being, Quality Education
The Sustainable Development Goals are ordered to address fundamental human needs before moving toward broader societal progress. The first four goals follow a logical sequence beginning with No Poverty and Zero Hunger. These are followed by Good Health and Well-being to ensure human survival and vitality. Finally, Quality Education is placed as the fourth goal, providing necessary tools for participation.

76. (B) The Brundtland Report (Our Common Future)
The formal concept of sustainable development gained global recognition in 1987 through the Brundtland Report, titled "Our Common Future." Published by the World Commission on Environment and Development, this landmark document defined the term and highlighted the urgent need for a new developmental path. It emphasized that economic growth must be integrated with environmental conservation to ensure a healthy planet.

77. (D) 2015
The 2030 Agenda for Sustainable Development was officially adopted by all United Nations Member States in 2015. This ambitious plan includes seventeen distinct goals designed to end poverty, protect the planet, and ensure peace and prosperity by the year 2030. The agenda

9. (D) Sunlight
Terrestrial ecosystems comprise both living and non-living elements. Sunlight serves as a purely physical, abiotic factor providing the essential energy required for photosynthesis. In contrast, components like humus, soil microbes, and fallen leaves are either living organisms or derived from biological matter. Therefore, sunlight is categorized as a fundamental non-living driver of environmental processes and energy cycles in the ecosystem.

10. (A) Primary producers occupy the first trophic level.
Trophic levels describe the specific position an organism occupies within a food chain. Primary producers, such as green plants and algae, always occupy the first trophic level by capturing solar energy. Herbivores follow at the second level, while various carnivores occupy higher stages. Energy availability decreases significantly at each successive level, leaving apex predators with the least available energy in nature.

11. (C) A is true but R is false.
The Western Ghats are recognized globally as a biodiversity hotspot due to their exceptional species richness and significant habitat loss. While they face severe anthropogenic pressures, they are actually home to a vast number of endemic flora and fauna. The suggestion that they contain few endemic species is factually incorrect, as high endemism is a defining criterion for such global hotspots.

12. (A) P-III, Q-II, R-I, S-IV
Conservation areas in Tamil Nadu focus on protecting specific vulnerable species. The Gulf of Mannar is famous for its marine biodiversity, including the dugong. Guindy National Park provides a refuge for the blackbuck within an urban setting. Mukurthi is dedicated to the Nilgiri Tahr, while Point Calimere serves as a critical sanctuary for various migratory bird species from around the world.

13. (A) Habitat fragmentation - Division of continuous habitats into smaller patches
Biodiversity faces numerous threats from human activities and environmental changes. Habitat fragmentation occurs when continuous natural landscapes are divided into smaller, isolated patches, disrupting wildlife movement. Poaching involves illegal hunting, while invasive species are non-native organisms that harm local ecosystems. Co-extinction describes the loss of a species following the extinction of another organism it depends on for its own survival.

14. (B) II and IV
Conservation strategies are divided into in-situ and ex-situ approaches. In-situ methods, such as biosphere reserves and national parks, protect species within their natural environments. Conversely, ex-situ conservation involves maintaining species outside their habitats, including zoological parks and botanical gardens. Techniques like seed banks and cryopreservation also fall under ex-situ management, ensuring genetic material is preserved for the future of species.

15. (C) Producers → Primary Consumers → Secondary Consumers → Tertiary Consumers
A grazing food chain represents the sequential transfer of energy starting from autotrophs. It begins with producers that synthesize food through photosynthesis. This energy moves to primary consumers, which are herbivores eating the plants. Subsequently, secondary and tertiary consumers, representing different levels of carnivores, obtain energy by preying on organisms from the preceding trophic levels in the hierarchical energy structure.

16. (C) Alpha diversity measures the total biodiversity across a large-scale geographical area.
Biodiversity is categorized into genetic, species, and ecosystem levels to describe biological variety. Alpha diversity specifically refers to the species richness within a particular local area or community. It is distinct from gamma diversity, which measures the total biodiversity over a large geographical landscape. Genetic and ecosystem diversity describe variations in genes and ecological processes, respectively, across different regions of the biosphere.

17. (B) Sacred Groves
Ex-situ conservation involves the preservation of biological components outside their natural habitats. Common examples include botanical gardens, zoological parks, and specialized gene banks. However, sacred groves are traditional

Click Here to Buy book on Amazon

being a prominent example used for diverse image recognition tasks.

86. (A) II, III, IV, I
The evolution of intelligent computing has followed a clear chronological path of increasing complexity. The broad concept of artificial intelligence was established first, followed by the development of machine learning techniques for data-driven predictions. Deep learning emerged later as computing power and data availability increased. Most recently, generative AI has gained mainstream adoption, allowing systems to create entirely new content based on patterns.

87. (B) Deepfake
Deepfake technology uses advanced machine learning algorithms to create highly realistic synthetic media where a person's face or voice is convincingly replaced. This capability raises significant ethical concerns regarding identity theft, financial fraud, and the spread of misinformation. While the technology has creative applications, its potential for abuse necessitates the development of detection tools and legal frameworks to protect individuals.

88. (C) Analyzing statistical patterns in large datasets to generate human-like text.
Generative AI models, such as ChatGPT, do not simply retrieve pre-written answers from a fixed database. Instead, they operate by analyzing massive datasets to identify complex statistical patterns in human language. When prompted, the model predicts the most likely sequence of words based on context, allowing it to generate original, human-like text. This process enables the AI to provide detailed explanations.

89. (D) Supervised Learning
Supervised learning is a fundamental paradigm in machine learning where a model is trained using a labeled dataset. This means that each piece of input data is paired with the correct output, providing a clear "teacher" for the algorithm. By learning the relationship between these inputs and outputs, the model can eventually make accurate predictions on new, previously unseen data.

90. (A) Rapid, scalable screening using smartphone-based image analysis.
The 'e-Paarvai' initiative in Tamil Nadu demonstrates the practical application of artificial intelligence in public health. By using smartphone-based image analysis, the system allows for rapid and scalable screening of cataract cases in underserved areas. This technology assists medical professionals by identifying patients who need treatment, thereby increasing efficiency. It does not replace ophthalmologists but serves as a powerful screening tool.

91. (A) Both A and R are true and R is the correct explanation of A.
Blockchain technology provides a high level of security due to its decentralized and distributed nature. Transactions are recorded in blocks that are cryptographically linked in a chronological chain across multiple network nodes. Because each block contains a unique hash, altering any information would require changing all subsequent blocks and gaining consensus. This design makes the system inherently tamper-evident and secure.

92. (A) P-II, Q-I, R-IV, S-III
A blockchain network relies on several core components to function securely without a central authority. Cryptography is used to protect data and verify the identity of participants. Smart contracts are self-executing programs that automatically trigger actions when specific conditions are met. The ledger acts as a transparent record of all transactions. Meanwhile, a consensus mechanism provides rules for all nodes to agree.

93. (A) Edge Computing - Processing data closer to where it is generated.
The Internet of Things involves a network of connected devices that collect and exchange data. Edge computing is a critical concept, referring to the processing of data close to its source rather than in a distant cloud. This reduces latency and bandwidth usage significantly. In contrast, sensors are responsible for detecting environmental changes, while actuators perform the required physical actions based on signals.

Downloaded from www.pdf.tube

three-stage solid-fuel vehicle capable of carrying payloads into low earth orbit, capturing the commercial small satellite market.

129. (B) A point where gravitational pull equals the centripetal force.
A Lagrange point is a specific location in space between two large orbiting bodies where the gravitational forces exactly balance the centripetal force required for a smaller object to move with them. This unique equilibrium creates stable points where a spacecraft can remain in a fixed position with minimal fuel. These points are ideal for scientific observatories like the Aditya L1 mission.

130. (D) IN-SPACe (Indian Space Centre)
IN-SPACe is a specialized autonomous agency under the Department of Space, established to promote and authorize private sector participation in the Indian space industry. It acts as a single-window interface for non-governmental entities, allowing them to use ISRO's facilities and engage in activities such as building satellites. By fostering a collaborative ecosystem, it aims to increase India's share of the global economy.

131. (A) Both A and R are true and R is the correct explanation of A.
Project Tiger is one of the world's most successful conservation programs, launched in 1973 to address the rapid decline of tiger populations in India. The initiative adopted a comprehensive ecosystem approach by establishing numerous tiger reserves. These reserves were structured with core inviolate areas for protection and surrounding buffer zones to manage human-wildlife interaction. This strategy has helped population recovery.

132. (A) P-II, Q-I, R-IV, S-III
Biosphere reserves are designated areas meant to demonstrate a balanced relationship between people and nature. Agasthyamalai is located in the Western Ghats, spanning across Tamil Nadu and Kerala. Pachmarhi is a prominent reserve in Madhya Pradesh. Nokrek is a critical habitat in the state of Meghalaya, while Similipal is a vast reserve in Odisha known for its rich and diverse biodiversity.

NODIA

133. (A) Project Nilgiri Tahr - Protecting the state animal in the Western Ghats.
Tamil Nadu has implemented several targeted initiatives to protect its endangered and endemic wildlife. Project Nilgiri Tahr is a flagship program focused on conserving the state animal within its natural mountain habitats in the Western Ghats. In contrast, the first Slender Loris sanctuary is located in interior districts. The first Dugong Conservation Reserve has been established in the Palk Bay region.

134. (C) I, II and III
The Gulf of Mannar Biosphere Reserve is a unique marine ecosystem, being the first of its kind in South and South East Asia. It is renowned for its diverse biological riches, including extensive coral reefs and lush seagrass beds. The reserve provides a critical sanctuary for the endangered dugong. While highly protected, it focuses on regulated sustainable practices for local community livelihoods.

135. (B) Dead Organic Matter → Detritivores → Predators
A detritus food chain represents a pathway of energy flow that begins with dead organic matter, such as fallen leaves and animal remains. This material is first consumed by detritivores, including earthworms and fungi, which break it down into simpler substances. These organisms are then eaten by small predators. This chain plays a vital role in recycling nutrients within various ecosystems.

136. (C) They cause habitat fragmentation, impeding the natural movement of wildlife.
The construction of linear infrastructure through forested areas significantly alters natural landscapes. The most direct consequence is habitat fragmentation, where once-continuous ecosystems are divided into smaller patches. This barrier can severely impede the natural movement and migration patterns of wildlife, leading to population isolation. Furthermore, such projects increase the risk of animal-vehicle collisions, further threatening the survival of vulnerable forest species.

data rates and broad coverage. High-band 5G delivers ultra-high speeds over short distances. Additionally, unlicensed spectrum bands are often used for private industrial networks for connectivity.

103. (B) Superposition - The ability of a system to be in multiple states.
Quantum computing operates on principles that differ fundamentally from classical computing. While classical bits are either zero or one, quantum bits can exist in multiple states simultaneously through a property known as superposition. This allows quantum computers to process massive amounts of information in parallel. Another key concept is entanglement, where particles become linked such that the state of one affects another.

104. (A) I and II
The National Quantum Mission is a significant initiative aimed at establishing India as a leader in quantum technology research. It focuses on nurturing scientific expertise and industrial applications across several domains, including quantum computing. The mission specifically targets the development of intermediate-scale quantum computers with 50 to 1000 physical qubits. This strategic investment is managed to drive innovation in this transformative field.

105. (A) I, II, III and V
5G technology is designed to support a diverse range of usage scenarios, categorized into three main pillars. Enhanced Mobile Broadband provides significantly faster internet speeds. Ultra-Reliable Low-Latency Communications enable critical real-time applications like industrial automation. Massive Machine Type Communications allow for the seamless integration of a high density of devices. Together, these features provide the foundation for a fully connected society.

106. (II, IV, V, I, III)
The evolution of mobile telecommunications has been marked by distinct generational shifts. The first generation introduced analog voice calls, followed by the second generation which brought digital signals and text messaging. The third generation enabled mobile internet access, while the fourth generation provided high-speed data for video. The latest fifth generation focuses on ultra-low latency and massive connectivity for industrial applications.

107. (B) Quantum Entanglement
Quantum entanglement is a unique physical phenomenon where pairs of particles are generated or interact in ways such that their quantum states are inextricably linked. This means that the state of one particle cannot be described independently of the other, and any measurement of one instantly determines the state of its partner, regardless of the distance between them. This is crucial for cryptography.

108. (C) 2022
The commercial introduction of 5G services in India officially began in 2022, following a successful spectrum auction. This rollout marked a major milestone in the country's digital journey, providing significantly faster mobile data speeds and improved connectivity for millions of users. Major telecommunications providers have since been expanding their networks. This advancement is expected to drive economic growth and support innovations.

109. (A) Quantum Bit (Qubit)
In classical computing, the smallest unit of information is the bit, which can be either a zero or a one. Quantum computing, however, utilizes the quantum bit, or qubit, as its foundational unit. Because of the quantum property of superposition, a qubit can exist in both states simultaneously, allowing a quantum computer to process far more information than traditional computers.

110. (C) Massive Machine Type Communications (mMTC)
Massive Machine Type Communications is one of the three primary usage scenarios defined for 5G networks. It is specifically designed to support the connection of an extremely high density of devices, up to one million per square kilometer, without overloading the network. This capability is essential for the widespread implementation of the Internet of Things, enabling applications such as smart city infrastructure.

Click Here to Buy book on Amazon

111. (A) Both A and R are true and R is the correct explanation of A.
CRISPR-Cas9 is a groundbreaking gene-editing tool that has revolutionized biological research by allowing for precise modifications to DNA. The system works by using a small piece of guide RNA to direct the Cas9 enzyme to a specific location in the genome. Acting like molecular scissors, the enzyme cuts the DNA, enabling scientists to add, remove, or alter genetic material precisely.

112. (A) P-II, Q-III, R-IV, S-I
Biotechnology encompasses various tools and techniques used to manipulate biological systems. Messenger RNA carries genetic instructions for protein synthesis, while recombinant DNA is created by combining genetic sequences from different organisms. Monoclonal antibodies are lab-engineered molecules designed to mimic the immune system's response to pathogens. Stem cells are unique undifferentiated cells with the potential to develop into many specialized cell types.

113. (B) Targeted Therapy - Treating cancer by attacking specific genes or proteins.
Precision medicine focuses on tailoring healthcare to the individual characteristics of each patient. Targeted therapy is a key component of this approach, specifically in cancer treatment, where drugs are designed to attack particular genetic mutations or proteins that drive disease growth. By focusing on these specific molecular targets, doctors can improve the effectiveness of therapy while reducing the associated side effects.

114. (A) I, III and IV
mRNA vaccines represent a significant advancement in immunology, using genetic instructions to teach cells how to produce a viral protein that triggers an immune response. Unlike traditional vaccines, they do not contain live or weakened viruses, making them safer and faster to produce. It is important to note that the mRNA does not enter the nucleus or alter the recipient's DNA.

115. (B) Guide RNA design → Complex formation with Cas9 → Target DNA identification → DNA cleavage → DNA repair/editing
The process of gene editing using CRISPR-Cas9 involves several highly coordinated steps in a laboratory setting. It begins with the design of a specific guide RNA that matches the target DNA sequence. This RNA forms a complex with the Cas9 enzyme, which then scans the genome to identify and bind to the correct location. Once bound, the enzyme cleaves the DNA.

116. (C) The mRNA strand integrates directly into the recipient's human genome.
mRNA vaccines work by delivering temporary instructions to cells, allowing them to produce a specific protein found on a virus. This protein is then recognized as foreign by the immune system, which produces antibodies. Crucially, the mRNA strand remains in the cytoplasm and is naturally broken down by the cell after it has been used. It does not integrate into the genome.

NODIA

117. (A) Reversing the gravitational pull in biological organisms.
CRISPR technology is being researched across a wide range of fields to solve complex biological problems. In medicine, it shows promise for curing genetic disorders like sickle cell anemia and developing targeted cancer therapies. In agriculture, it is used to create crops resistant to pests. However, the technology is limited to biological genetic sequences and cannot alter fundamental physical forces like gravity.

118. (D) Recombinant DNA technology
Recombinant DNA technology is a fundamental tool in modern biotechnology that allows for the creation of new genetic combinations. By using specialized enzymes to cut and join DNA fragments from different sources, scientists can produce sequences that are not found naturally in any single organism. This technique is used to produce essential medicines like insulin and develop genetically modified crops.

119. (B) Tailor treatment to individual patient characteristics.
The primary objective of precision medicine is to move away from the traditional "one-size-fits-all" approach to healthcare. Instead, it aims to tailor medical treatments and prevention strategies to the unique genetic, environmental, and lifestyle characteristics of each individual patient. By using advanced diagnostic tools and data analysis, doctors can select the most effective therapies for a specific person while minimizing risks.

120. (C) Bioremediation agents
Bioremediation agents are microorganisms that have been naturally selected or genetically engineered for their ability to neutralize environmental pollutants. These microbes can consume and break down hazardous substances such as oil and heavy metals, converting them into less harmful byproducts like water and carbon dioxide. This biological approach provides a cost-effective and environmentally friendly solution for cleaning up contaminated industrial sites.

121. (B) Both A and R are true but R is not the correct explanation of A.
Chandrayaan-3 was a landmark mission for India, successfully demonstrating the nation's technical capability to achieve a safe and soft landing on the lunar surface. This achievement made India the first country to land a spacecraft specifically near the Moon's South Pole, a region of scientific interest. While both statements are true, the landing location is a significant milestone rather than the explanation.

122. (A) P-II, Q-I, R-IV, S-III
ISRO is actively pursuing diverse scientific missions to explore space and monitor our planet. Aditya L1 is a solar observatory designed to study the Sun's atmosphere from a stable vantage point. The Gaganyaan program aims to achieve India's first human spaceflight. NISAR is a collaborative earth-observation mission using radar. XPoSat is a specialized satellite focused on measuring the polarization of X-rays from celestial sources.

123. (B) Param Pravega - India's first fully reusable launch vehicle
India has launched several major scientific initiatives to foster innovation and technological self-reliance. IN-SPACe was created to encourage the participation of the private sector in space-related activities. LIGO-India will observe gravitational waves to deepen our understanding of physics. However, Param Pravega is actually one of the fastest supercomputers in India, rather than a reusable launch vehicle. Reusable technology is handled separately.

124. (D) I, II and III
Aditya L1 is India's first dedicated space mission to study the Sun. It is positioned in a halo orbit around the first Lagrange point of the Sun-Earth system. This strategic location enables continuous observation without eclipses. The mission investigates the solar corona, solar wind, and flares, providing crucial data for understanding solar dynamics and their impact on various space weather events.

125. (A) I, II, III and IV
The NISAR mission is a major international collaboration between NASA and ISRO to monitor Earth's changing environment. It utilizes advanced dual-frequency synthetic aperture radar to map the entire globe every twelve days. This high-resolution data will be used to study various ecosystems, measure the movement of ice sheets, and track natural hazards. The mission focuses on Earth observation rather than asteroid mining.

126. (A) I, III, IV, II
India's development of satellite launch technology has progressed through several generations of increasingly powerful vehicles. The journey began with the Satellite Launch Vehicle, followed by the Augmented Satellite Launch Vehicle. The Polar Satellite Launch Vehicle was then developed as a reliable workhorse for earth observation missions. Finally, the Geosynchronous Satellite Launch Vehicle was introduced to carry heavier communication satellites into geostationary orbits.

127. (D) GSLV utilizes a cryogenic upper stage for lifting heavier payloads.
PSLV and GSLV are the two main types of launch vehicles used by India, each serving different mission profiles. PSLV is known for its versatility in placing satellites into polar orbits and launching interplanetary missions. In contrast, GSLV is designed to lift much heavier payloads into geosynchronous transfer orbits. A defining feature of GSLV is its use of a cryogenic upper stage.

128. (C) It offers 'launch on demand' flexibility for small satellites.
The Small Satellite Launch Vehicle was developed by ISRO to meet the growing global demand for launching small satellites quickly and affordably. Its primary feature is 'launch on demand' flexibility, which allows for rapid integration compared to larger launch vehicles. The SSLV is a

Downloaded from www.pdf.tube

provide scientific assessments on climate change. It does not conduct its own original research; instead, it synthesizes peer-reviewed studies to provide a clear scientific basis for policy. Its influential reports have earned it the Nobel Peace Prize and have been instrumental in advocating for a shift toward renewables.

146. (A) I, V, III, IV, II
The nitrogen cycle involves a series of complex biological transformations that circulate nitrogen through the environment. It begins with nitrogen fixation, where atmospheric nitrogen is converted into a usable form for plants. This is followed by nitrification, turning ammonia into nitrates. Plants then absorb these nutrients through assimilation. After organisms die, ammonification releases nitrogen back. Finally, denitrification converts nitrates back into gaseous nitrogen.

147. (A) Nitrogen oxides (NOx), Volatile Organic Compounds (VOCs), and sunlight.
Photochemical smog is a complex mixture of pollutants that forms in the atmosphere under specific environmental conditions. Its primary components are nitrogen oxides and volatile organic compounds, which are often emitted by vehicles. When these chemicals are exposed to intense sunlight, they undergo reactions that produce ground-level ozone. This type of smog is most common in large, sunny urban areas and respiratory issues.

148. (C) All bioplastics are guaranteed to completely biodegrade in natural environments within weeks.
Bioplastics are manufactured from renewable biological resources like corn starch, offering a potential way to reduce reliance on fossil fuels. While some are designed to be compostable, it is a common misconception that all bioplastics will naturally biodegrade quickly. Some varieties are chemically identical to traditional plastics and can persist for long periods. Therefore, proper disposal and specialized composting facilities are required.

149. (A) Agricultural runoff carrying fertilizers and pesticides into a river.
Water pollution is classified into point and non-point sources based on how contaminants enter the environment. A point source refers to a single, identifiable outlet like a factory pipe. In contrast, non-point source pollution is diffuse and originates from a broad area. Agricultural runoff, which carries fertilizers from numerous fields into local rivers during rainfall, is a classic example of this type.

150. (D) Carbon sequestration
Carbon sequestration is a critical process for mitigating global warming by reducing the concentration of carbon dioxide in the atmosphere. This can occur naturally through biological processes, such as trees absorbing carbon, or through engineered methods that capture industrial emissions. By effectively locking away this greenhouse gas, sequestration helps to slow the rate of climate change and provides a pathway toward achieving net-zero targets.

151. (A) Both A and R are true and R is the correct explanation of A.
Hydrogen fuel cells are increasingly recognized as a vital clean energy technology for the future of transportation. Unlike traditional engines that release greenhouse gases, fuel cells generate electricity through a chemical reaction between hydrogen and oxygen. The only direct by-product is pure water vapor, making it an environmentally friendly alternative. When the hydrogen is produced using renewable energy, the process becomes carbon-neutral.

152. (A) P-II, Q-I, R-IV, S-III
Modern technological advancements are transforming how we interact with information and manufacture objects. Augmented reality overlays digital data onto our real-world environment, while virtual reality provides a completely immersive simulated experience. 3D printing creates three-dimensional objects by depositing materials layer by layer. Nanotechnology involves the manipulation of matter at the atomic scale, enabling the development of new materials with unique properties across medicine.

153. (D) Gulf of Mannar region - High potential for wind installations.
The Gulf of Mannar region in Tamil Nadu has been identified as having some of the highest

NODIA

137. (D) It generates awareness and provides alternative livelihoods for locals.
Regulated ecotourism in wildlife sanctuaries provides a sustainable way to balance environmental conservation with social development. A primary advantage is that it generates public awareness about protecting fragile ecosystems. Additionally, it creates alternative livelihood opportunities for local communities, reducing their dependence on forest resources. When properly managed, ecotourism ensures that tourism activities do not disturb sensitive zones while providing support for conservation.

138. (A) Ecotone
An ecotone is a dynamic transition zone where two or more distinct ecological communities meet and integrate. These areas, such as the border between a forest and a grassland, often exhibit higher species diversity and density than either of the surrounding ecosystems. This phenomenon is known as the "edge effect." Ecotones are critical for the movement of species between various biological habitats.

139. (B) Montane grasslands and rocky terrains of the Western Ghats.
The Nilgiri Tahr is a unique mountain ungulate that is endemic to the southern part of the Western Ghats. It is specifically adapted to the high-altitude montane grasslands and steep, rocky terrains that characterize this mountain range. These habitats provide the species with essential grazing grounds and protection. Conservation efforts aim to protect these fragile alpine ecosystems from degradation and fragmentation.

140. (B) Palk Bay
India's first dedicated Dugong Conservation Reserve has been established in the shallow coastal waters of Palk Bay, off the coast of Tamil Nadu. This region is a vital habitat for the endangered dugong, which depends on the extensive seagrass beds found there for food. The reserve aims to protect these seagrass ecosystems and reduce human-induced threats such as habitat loss and accidental entanglement.

141. (A) Both A and R are true and R is the correct explanation of A.
Biological Oxygen Demand is a critical parameter used to assess the level of organic pollution in a water body. When high amounts of organic waste are present, aerobic bacteria multiply rapidly to decompose the material. This process requires a significant amount of dissolved oxygen, leading to a high BOD value. Measuring BOD helps scientists understand the impact of sewage on aquatic health.

142. (A) P-II, Q-III, R-I, S-IV
Several international conventions have been established to manage hazardous substances and protect global health. The Basel Convention regulates the transboundary movement of hazardous wastes, while the Rotterdam Convention ensures informed consent for trade. The Stockholm Convention aims to eliminate Persistent Organic Pollutants. Finally, the Minamata Convention focuses on reducing mercury emissions and releases, addressing the toxic effects of this heavy metal worldwide.

143. (D) Cartagena Protocol - Global ban on all fossil fuel extraction
International environmental agreements target various challenges, such as the Kyoto Protocol's focus on emission reductions and the Montreal Protocol's success in phasing out ozone-depleting substances. The Paris Agreement is the current framework for limiting temperature rise. However, the Cartagena Protocol is specifically concerned with biosafety and the safe handling of living modified organisms. It does not mandate a global fossil fuel ban.

144. (D) I, II and III
The Pallikaranai marshland is a vital ecological asset for Chennai, serving as one of the last remaining natural freshwater wetlands in the region. It plays a crucial role in flood mitigation and rainwater harvesting. Recognizing its international importance, it has been designated as a Ramsar site. Despite its significance, the marsh has faced threats from urban encroachment and illegal solid waste dumping.

145. (A) I, III, IV and V
The Intergovernmental Panel on Climate Change is a leading international body established to

Click Here to Buy book on Amazon

Visit :
www.pdf.tube

Download PDFs For :

- ✓ MPPSC Chapterwise Question Bank
- ✓ KVS/NVS Chapterwise Question Bank
- ✓ KVS/NVS 30 Sample Papers for Tier-II
- ✓ DSSSB TGT Chapterwise Question Bank
- ✓ DSSSB Sample Papers
- ✓ Chapterwise Question Bank
- ✓ JEE NEET Foundation
- ✓ Primary Classes Worksheets
- ✓ Olympiad Guide
- ✓ Sample Papers
- ✓ Previous Year CBSE Papers
- ✓ Previous JEE, NEET and CUET Papers

Nodia Editions LLP
125, Sector 6, Vidhyadhar Nagar, Jaipur 302039

MRP ₹ 510.00

potential for offshore wind energy in India. This area experiences strong and consistent wind currents suitable for large installations. Unlike onshore wind farms, offshore projects minimize land-use conflicts. In contrast, hilly regions like the Nilgiris or Palani Hills are typically categorized as onshore wind sites.

154. (A) I, II and IV
The Muppandal Wind Farm is a prominent landmark in India's renewable energy landscape, ranking among the largest onshore wind facilities in the world. Its location near Kanyakumari takes advantage of a unique geographic funneling effect, where the Western Ghats mountain range concentrates wind flow. This massive facility has played a critical role in making Tamil Nadu a national leader in wind capacity.

155. (B) Coal dominance → Expansion of Renewables → Green Hydrogen Integration → Net Zero Emissions
India is currently pursuing a structured energy transition to fulfill its international climate commitments while meeting its growing power needs. The process begins with a move away from traditional dominance in coal toward a massive expansion of renewables. The next phase involves integrating green hydrogen into heavy industrial sectors. Ultimately, these efforts lead the country toward achieving net-zero emissions by 2070.

156. (A) Carbon Footprint
A carbon footprint represents the total amount of greenhouse gases released into the atmosphere as a result of the activities of a particular individual or organization. It is a comprehensive measure that accounts for everything from direct energy consumption in homes to the indirect emissions associated with the production of goods. Reducing our carbon footprint is essential for slowing global warming trends.

157. (A) Metaverse
The metaverse is an emerging technological concept that envisions a highly immersive and interconnected shared digital space. It is built by integrating several advanced technologies, including Web3 for decentralized ownership, as well as virtual and augmented reality for creating realistic interactive environments. Users can interact through digital avatars, enabling new forms of social interaction, entertainment, and commerce in a spatial digital environment.

NODIA

158. (C) AR enhances the real world, while VR immerses the user in a simulation.
Augmented reality and virtual reality offer distinct ways of blending digital and physical worlds. AR functions by overlaying digital information onto the user's actual environment, enhancing the real world with interactive elements. In contrast, virtual reality uses a headset to completely immerse the user in a computer-generated simulation. While both have unique applications, they rely on different principles to create digital experiences.

159. (D) Electrolysis of water powered by renewable energy sources.
The National Green Hydrogen Mission is a key strategic initiative aimed at making India a global hub for the production of clean hydrogen. A fundamental feature is the production of hydrogen through the electrolysis of water. For the hydrogen to be considered "green," the entire process must be powered by renewable energy sources such as solar. This ensures production is carbon-neutral.

160. (C) Solid Waste Management Rules, 2016
The Solid Waste Management Rules of 2016 introduced a framework to modernize waste handling in India. A central directive is the mandatory segregation of waste at the source by generators. Refuse must be separated into three categories: biodegradable, non-biodegradable, and domestic hazardous waste. This practice improves recycling efficiency and ensures hazardous materials are handled safely to prevent environmental contamination.

www.nodia.in

94. (A) I, II and IV
'Nambikkai Inaiyam' is a strategic blockchain initiative launched by the Tamil Nadu government to modernize and secure its e-governance infrastructure. The system is designed to protect government documents and data from tampering, ensuring their integrity over time. It also facilitates the issuance of verifiable electronic certificates. While it utilizes blockchain for record-keeping and transparency, it does not replace traditional physical currency.

95. (B) Sensors → Connectivity → Data Processing/ Cloud → User Interface
The standard operation of an Internet of Things system involves a logical flow of information from the physical world to the user. It begins with sensors that collect environmental data, which is then transmitted via various connectivity options. This data is sent to a central cloud for analysis. Finally, the processed information is presented to the user through an interface, allowing informed decision-making.

96. (C) Real-time monitoring of soil moisture to optimize local irrigation.
Implementing the Internet of Things in agriculture, often called "Smart Farming," focuses on using data to optimize resource usage. A primary feature of this approach is the use of sensors for real-time monitoring of soil moisture and nutrient levels. This information allows farmers to apply water and fertilizers only when and where they are needed, reducing waste and increasing overall productivity.

97. (B) A smart bin that alerts waste management when it is full.
Smart cities utilize Internet of Things sensors to enhance the efficiency of urban services and infrastructure management. A practical application is the use of smart waste bins equipped with fill-level sensors. These devices alert waste management teams only when a bin is full, allowing for optimized collection routes and reduced costs. This technology helps prevent bin overflows and improves urban cleanliness.

98. (D) Single point of failure such as a server crash.
Public blockchain networks are designed with a high degree of resilience due to their decentralized architecture. Because data is stored across thousands of independent nodes worldwide, they do not have a single point of failure, making server crashes unlikely to disrupt the entire network. However, these systems remain vulnerable to other threats, such as 51 percent attacks or software bugs in contracts.

99. (A) It will enhance transparency and drastically reduce property fraud.
Implementing blockchain technology in land registry systems has the potential to revolutionize how property records are managed. By creating a permanent and transparent record of ownership, the system significantly reduces the risk of property fraud and illegal document alterations. This decentralized approach increases trust among buyers and sellers by providing a verifiable history of land titles and streamlining the registration process.

100. (C) High risk of cybersecurity threats and data privacy breaches.
While the Internet of Things offers significant benefits for smart city management, it also introduces substantial risks related to cybersecurity and data privacy. The interconnection of thousands of devices creates numerous entry points for potential hackers to disrupt critical infrastructure or steal sensitive personal information. Ensuring the security of these vast networks and protecting citizen privacy remains a major challenge for urban planners.

101. (A) Both A and R are true and R is the correct explanation of A.
5G technology represents a major leap in telecommunications, offering significantly lower latency compared to previous generations. This reduction in delay is critical for applications that require near-instantaneous responses, such as remote robotic surgeries and autonomous vehicles. By ensuring that data is transmitted with minimal lag, 5G enables a new range of real-time digital services that were previously impossible in older networks.

102. (A) P-III, Q-I, R-II, S-IV
5G networks utilize different frequency bands to provide a combination of speed and coverage. Low-band 5G offers extensive geographic reach but relatively slower speeds. Mid-band 5G is designed to provide a balance between high

Downloaded from www.pdf.tube